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Carbide and Carbon Chemicals Corporation Operating  
Contractor for the U.S. Atomic Energy Commission.

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Series

THE KELLEX CORPORATION

WEEKLY PROGRESS REPORT

REPORT NO.

KZ 3218

PROCESS ENGINEERING GROUP AT SITE

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UNCLASSIFIED

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*Say D. Hall*  
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12 OCT 95

10/25/95

OK 082 unit 12/18/95

C-616 Cascade

RESTRICTED DATA August 25, 1945  
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as defined in the Atomic Energy Act of  
1946. Unauthorized disclosure subject  
to Penalties and Criminal Sanctions.

At 7:50 A.M. 8/19 all cells of Section K-306, which were operating in the cascade, were shut down because the power house momentarily dropped the load to this section. Immediately the sectional block valves were closed and all buildings of section K-306 were isolated from the cascade. At 8:30 A.M. the power was supplying sufficient electricity to start the cells of section 306. Buildings K-306 and 307 were started on direct recycle but all other buildings in this section were started on building inverse recycle to prevent overloading the bottom cells in the section. Section K-306 was placed back in the cascade at 12:15 P.M. 8/19.

On 8/22 the Instrument Dry Air failed to section 300. Immediately the buildings in all sections, except, section 3A and buildings K-305-1 to K-305-4, were isolated and placed on building inverse recycle. Section 3A and buildings from K-305-1 to K-305-4 did not have to be isolated on building inverse recycle immediately as these buildings contained an automatic tie-over from instrument air to plant air which worked satisfactorily. Finally it was necessary to isolate buildings K-304-1 to K-304-4 and place them on building inverse recycle because of pressure surging. Due to the instrument air failure and to the isolations of buildings, 19 cells scattered through the cascade tripped out or were shut down because of an overload. The instrument air failure lasted for but a few minutes. After the air supply was normal the pressures were adjusted and 18 of the 19 cells, which were shut down, were started. One cell could not be started because of impeller rubbing. Gradually sectional cascades were set up. Section K-306 was connected to K-305-12 and then a section from K-305-5 to K-305-11 was connected to the bottom of K-306 section. A section from K-304-5 to K-305-4 was connected to the bottom of K-305-5. Then buildings K-304-1, 2, 3, and 4 were connected to the cascade, a building at a time, as these buildings had excessive inventory. A section from K-311-1 to K-301-5 was connected to a section from K-302-1 to K-303-10. Then the two final sections of the cascade were connected together.

The reason for the dry instrument air failure is believed to be as follows:

The power failed which actuates a solenoid valve to hold pressure on the unloader valves of the dry instrument air

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to the public by:

*Dr. J. S. Quinn*  
Technical Information Officer

Date

12/18/95

compressors in the dry air plant. These valves opened and unloaded the compressors. If the duration of the failure had been longer the ambient air system would also have failed since the control circuit affected, likewise, controls the ambient air by-pass valves around the compressors. Due to a leak in the system, these valves were not affected in the short time of failure.

was

During the failure, G-74/ manually turned into the dry air system at the crossover at 303-10. However, the capacity of the G-74 system was not sufficient to raise the pressure in the dry air system to operating level.

#### Section 600.

The east loop of section 600 was isolated from the cascade at 8:55 A.M. 8/18 and shut down to replace the seal in the Elliott pump which had a high inlet leakage. At 12:50 A.M. 8/18 the west loop tripped out from overload. Immediately K-311-1 was connected to the surge drums in the intersectional cell of K-309-3. The east loop was started and placed on cascade at 9:00 P.M. 8/18 and K-309-3, intersectional cell, was isolated. The west loop was started and placed in the cascade at 2:20 P.M. 8/19.

Section 600 continued to operate with both loops in operation during the instrument air failure. When the instrument air failed the control valves of section 600 opened dumping inventory into K-311-1 and caused 5 cells to trap out.

#### Cascade Purging

Purge rates for the past week at both the 303-10 and 305-12 purge points are tabulated in Table I. Analysis of the purge for the period from 8/8 to 8/18 are also shown. During this time the effluent from the cold traps had the following average composition:

	<u>Mol % C-616</u>
K-303-10	.01
K-305-12	.018

No OA analysis are shown since a new type analyser is being installed.

A total of 17,853 scf of gas has been purged through the 305-12 purge point resulting in a "pick up" of 3.5% in the carbon trap.

TABLE I  
CASCADE PURING

<u>K-303-10</u>			<u>K-305-12</u>		
<u>Date</u>	<u>Rate</u> <u>SCFD</u>	<u>Analysis</u> <u>Mol % C-616</u>	<u>Date</u>	<u>Rate</u> <u>SCFD</u>	<u>Total Rate</u> <u>SCFD</u>
8/8	1360	-	8/8	500	1860
8/9	1800	-	8/9	500	2300
8/10	2070	-	8/10	470	2540
8/11	1225	-	8/11	410	1635
8/12	810	-	8/12	325	1135
8/13	1000	.03	8/13	430	1430
8/14	1500	.07	8/14	510	2010
8/15	1470	.10	8/15	1060*	2530
8/16	1930	.17	8/16	1100	3030
8/17	2160	.37	8/17	2160**	4320
8/18	2010	.50	8/18	1450	3460
8/19	1710	-	8/19	1020	2730
8/20	1950	-	8/20	1200	3150
8/21	1750	-	8/21	1000	2750

NOTE: \* 306 Buildings added  
 \*\* 306 purge valve left open

#### Valley Iron "R" Pump

311-1 The bellows on the bellows seal "R" pump (#77) developed a high inleakage rate on the morning of 8/20/45. The pump was shut down at 1:06 P.M. and the bellows chamber removed for inspection. It was found that a crack had formed on the uppermost active convolution on the third bellows from the bottom.

The pump is being completely dismantled, including bearings, Scotch yoke, as well as the bellows.

Running time to shut down--2169 hrs.

310-3 The carbon seal pump was started on its seventh run on 8/18/45 at 9:40 A.M. with a new set of rings (Miller Polymer P-8 for process rings, others graphite). The pump has been operating satisfactorily with a seal in-leakage of about 0.05 scf/hr. Running time to 8 A.M. 8/24/45--134 hrs.

312-1 Test runs have been discontinued in 312-1. The carbon seal test loops have been cut away, and the pumps are now being installed into the building piping (Cell 8). These pumps will be refitted with bellows seals before operation.

#### Recovery Room Operations

From 8/17/45 to 8/23/45 inclusively, the recovery cold trap rooms were utilized to service 13 cells. Miscellaneous uses included the purging of the mobile 600 unit and the evacuating of the G-74 from buildings K-302-3 and K-302-4. These buildings were isolated from the cascade and put on direct re-

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cycle in order to place new seal exhaust Kinney pumps in operation. Nine out of the 13 cells which were serviced had just come off stream for repairs.

During this period of time, the average evacuation of a cell coming off stream held up in the recovery equipment 17 lbs. of C-616 for 24 hours. The average inventory of the plant was 38,000 lbs.

The following tabulation gives the percentage of cells serviced per day and the fraction of inventory off stream due to recovery.

<u>No. of Cells Evacuated</u>	<u>Possible Cell Days</u>	<u>% Serviced Per Day</u>	<u>% Inventory Off Stream Due To Recovery</u>
9*	3354	.254	.058
4**		.119	

NOTE: \* Cells coming off stream for repairs.  
\*\* Cells serviced with recovery equipment other than those just coming off stream for repairs.

#### Valves

Three Crane G-17-AP valves were chosen at random from a recent shipment to the Site, and were examined. The data collected on these valves is given below:

##### G-17-AP 14" #84

Shipped from Crane Company with the following leak rate (as checked by Terch and B.H., 8/13)

#1	6.68 m.c.f.h.
#2	5.84 m.c.f.h.

Examination showed considerable dirt and some aluminum slivers on the valve seats. The mating rings showed signs of aluminum interference.

A pressure test at 5 psig and 425 ft. lbs. torque showed a slight bubbling from one screw on seat #1.

Carbide's leak rate at 425 ft. lbs. torque was	#1	26.44 m.c.f.h.
	#2	0.21 m.c.f.h.

##### G-17-AP 14" #85

The original Crane leak rate (by Kroll and B.H., 8/13) on this valve was:

#1	0.25 m.c.f.h.
#2	1.97 m.c.f.h.

Aluminum filings were found on the seats of the valve. Disc #1 failed to rotate and disc #2 rotated with difficulty.

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At 5 psig pressure and 425 ft. lbs. torque there was a slow bubbling through one screw of seat #1.

Carbide's leak rate at 425 ft. lbs. torque was #1 14.8 m.c.f.h.  
#2 17.0 m.c.f.h.

G-17-AP 12" #236

The original 12" Crane leak rate (by Kroll and B.H., 8/13) on this valve was;

#1 2.33 m.c.f.h.  
#2 1.19 m.c.f.h.

This valve was in a good condition. There was no apparent interference between the retaining ring and the seating tube, but there was a small amount of filings and dirt on the valve floor.

At 5 psig pressure and 425 ft. lbs. torque, a slow bubbling through one screw of seat #2 was noticed.

Carbide's leak rate at 425 ft. lbs. torque was #1 0.85 m.c.f.h.  
#2 0.53 m.c.f.h.

Examination of G-17-AP Valves in K-27

Twenty 12" Crane G-17-AP valves were inspected in Buildings 402-4 and 402-5 of K-27 after one port had been welded into the line. A summary of the results shows:

- (1) Fifteen of the valves had dirt on the valve floor. The contamination consisted of flux, rust particles, aluminum filings, soft black material, and hard black particles.
- (2) The dirt was also in the valve port and piping which had been welded and can be said to come directly from the welding procedure. The Mechanical Department has been notified that at present the installation group makes no attempt to clean out this contamination.
- (3) Seven valve seats had small amounts of aluminum filings or fine brown particles on them.
- (4) The seating tube of one valve showed slight scuffing by the retaining ring.

Coolant System

The following is the tabulation of the data collected from coolant systems which contain rubber packed Chapman valves. These valves are being tested periodically with the Infra-Red analyzer, and were found to be leak tight when last tested on August 22, 1945.

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<u>Bldg.</u>	<u>Number of Cells</u>	<u>Type of Valves</u>	<u>Number of Valves</u>	<u>Type of Packing</u>	<u>Date Packed</u>	<u>No. of Days Exp. To C816</u>
K303-6	1	4" Discharge	1	Butyl rubber rings	4/24/45	123
K-304-4	1	1 $\frac{1}{2}$ " Chapman	1	Neoprene strip rubber	7/10/45	42
K-304-5	8	1 $\frac{1}{2}$ " Chapman	8	Neoprene strip rubber	7/10/45	42
E305-10	9	1 $\frac{1}{2}$ " Chapman	9	Butyl rubber rings	7/27/45	28
K305-10	9	1 $\frac{1}{2}$ " Chapman	11	Butyl rubber rings	7/27/45	28
K305-10	1	3/4" Chapman	1	Butyl rubber rings	7/27/45	28
K305-10	4	4" Discharge	4	Butyl rubber rings	7/27/45	28
K306-4	14	1 $\frac{1}{2}$ " Chapman	14	Neoprene strip rubber	8/1/45	12
K306-4	14	1 $\frac{1}{2}$ " Chapman	42	Neoprene strip rubber	8/1/45	12

A test has been run in Building K-303-2 to find out how much C-816 could be recovered from the vapors left in a cell system after it has been blown to the drain drum. A portable C-716 unit was used for this purpose. Eleven pounds of coolant were recovered by this method. A second test will be run to check on these results.

#### Ambient Air

Concrete vibrators settled the lower and upper beds of Hydrier #1 about 6 inches. The beds were then filled and tamped so the alumna would be in contact with the screens, to hold the beds down securely. About 20,000 additional lbs. of alumna were required to fill both beds to the proper level.

Hydrier #2 was opened and again the alumna was about 6 inches below the screen of each bed. Two craters 1 to 2 feet in diameter were found in the lower bed, indicating channeling in this Hydrier. The alumna was slightly yellow in color. An extraction will be run on the sample of the alumna to see if any oil is present.

Mr. Birchall, of Carbide, reported that the flow of dry air to many cell enclosures in the 304, 305, and 306 sections was in excess of 2.5 scfm per cell. Of 218 cells tested, 139 were found to have flows about this value. The average flow in the bad cells was 40 scfm, some cells consuming over 100 scfm. The flows were calculated from the pressure drop between the present supply header and the cell.

A check on Carbide's report was made with three cells using the method developed by the Kellex Structural Department, which meters the flow of gas required to maintain a positive pressure of 1.5 inches water in the cell. General agreement was found between the Carbide and Kellex methods.

At present the air plant delivers about 36,000 scfm of -60°F. Dew Point air composed of more than 60% makeup air.

### Dry Instrument Air

Pressure gages installed behind the filters in Building 304-4 showed, that in both dry instrument air and plant air, the pressure drop across the filters was less than 1.0 psi initially and has not changed after three weeks' operation. Plans are in progress to install filters of the type tested in 304-4 in the entire plant.

### G-74

The Dew Points on the G-74 received from Section 1408 have been consistently high during the past week, at no time being reported to have a Dew Point of  $-100^{\circ}\text{F}$ . The average Dew Point was about  $-80^{\circ}\text{F}$ .

### Analytical

#### Impurity in K-25 Product

The impurity in the product shipped to T.E.C. last week was reported by Mr. Priest to be 0.01 to 1% by weight, with a density of 1.788 g./cc, a refractive index of 1.37, and a molecular weight of 378.

A distillation at 743 m.m. pressure of a 10 cc. sample of the contaminant, separated at Y-12 from 1345 grms. of product, revealed the following:

- (1) A first cut of 5%, with a boiling range of 45 -  $95^{\circ}\text{C}$ .
- (2) A second cut of 80%, with a boiling range of 95 -  $102^{\circ}\text{C}$ .
- (3) A third cut of 10%, with a boiling range of 102 -  $110^{\circ}\text{C}$ .

Infra-red absorption studies revealed no traces of either 714 or 816.

Mr. Vanstrom reports that the line recorders have been scanning the buildings for the past week, but have been unable to determine the source of the contamination, since the material, indicated by a 72 - 74 mass peak, is found scattered throughout the upper parts of the plant above the 305-5 building. Highest concentrations during the last week have been recorded at 305-7 and 306-5.

Firestone rubber (40% M.F.L. residues) was suspected as the source of the contaminant, but work in the Priest laboratories eliminated this possibility. Samples of this rubber were treated with C-216 and then pumped on, but only traces of condensible materials were found in the traps.

The laboratories are at present making a complete chemical analysis of the sample, as well as determining the effect of C-216 on a sample of Aerochlor. (Aerochlor was suggested as a possible source of the contamination, since it was used in some of the pumping units used during the leak testing of the upper stages of the cascade.)



C-216 Disposal Tower Analysis

The C-616 content of the caustic solution in the C-216 Disposal Tower was reported last week to average 7.8 mg. T/liter of solution. The X assay of the samples containing 10 or more mg. T/liter were as follows:

<u>Sample No.</u>	<u>Count/50 ml.</u>	<u>Counts/liter</u>	<u>Mg. T/liter (Chemical Analysis)</u>	<u>Counts/mg.</u>
1542	163	3260	11	297
1544	120	2400	12	200
1585	75	1500	24	63
1594	118	2360	11	214
1645	82	1640	20	82
1677	56	1120	10	112
1736	37	740	17	44
1748	38	760	43	18
1786	35	700	13	54
1820	26	520	10	52

The laboratory reports that the results could be low by as much as a factor of 3, due to contamination of the samples. This would mean that the count/mg. varied from 54 to 891. Normal material has a count of 550 - 600 counts/mg. Although the accuracy of the above results is very poor, it seems to indicate that the material has little, if any, enrichment.

Special Analyzers

Two OA analyzers are now in use--

- (1) The "freeze-out" analyzer shows HF percentages between 0 and 1%.
- (2) The H<sub>2</sub> conversion analyzer gives values of less than 1%.

Two space recorders for 616 analysis are in operation at the present time. The recorder at 305-12 showed 1 - 10 p.p.m. at sampling points before and after the Beach-Russ pump, but before the cold trap. The 312-3 recorder was put in operation on 8/22/45, but it is too early to draw any conclusion from the few initial results.

Examination of the Plugging of the C-216 Disposal Line

A check was made on 8/23/45 and 8/24/45 of the C-216 Disposal Line from the Process Area to the Disposal Plant, and the following information was obtained from the preliminary report released:

- (1) The straight sections of the line from the Process Area to the first U bend appear to be clean.
- (2) The U turn closest to the Process Area may contain some build-up of material.
- (3) The U turn closest to the Disposal Tower definitely contains some material.

- (4) The straight sections between the two U turns, and from the U turn to the Disposal Tower, apparently are clean.
- (5) The piping around the pump house gives definite indications of some build-up (This was previously reported when these lines were probed by tapping.)

The instrument used indicates wall thickness by the change in the ionization of a gas when the object to be measured is interposed between the source of gamma rays and the ionization cell.

C. A. Johnson  
C. A. Johnson

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Series A

Carbide and Carbon Chemicals Corporation Operating  
Contractor for the U.S. Atomic Energy Commission.

KELLEX CORPORATION

WEEKLY PROGRESS REPORT

PROCESS ENGINEERING GROUP AT SITE

REPORT NO.

KZ 3217

Classification changed to:

UNCLASSIFIED

August 21, 1945

Cascade Operation

ADD or ADD to (Name, Title, and Category)

Say D. Hall

12 OCT 95

10/25/95

00 12/18/95

At 8:20 A. M. August 11, Building K-310-1 was isolated because air was accidentally allowed to enter the cascade through the cold trap while material was being flashed from the cold trap to cell 1 of K-310-1. The inleakage rate was from 40,000 to 50,000 scf/day. 350 scf of air entered the cascade. Cell 1 as well as the cold trap were isolated from the building. Apparently a second cold trap was accidentally valved into Cell 1 of K-310-1 while the cold trap was open to the atmosphere by way of a carbon trap. K-310-1 was placed back in the cascade at 8:45 A. M. 8/11. The cascade was split between Cells 6 and 8 of K-302-5 at 8:45 A. M. 8/11 to trap the air but the "A" outlet block valve of Cell 8 leaked and allowed a considerable amount of air to continue up the cascade before the "A" outlet valve of Cell 6 could be closed. The air which was collected in Cell 8 of K-302-5 could not be evacuated to the cold trap because of the leaking "A" outlet block valve so the cell was evacuated to the cascade. Cell 10, which was also used to collect air, however, was evacuated to the cold trap. The cascade was connected together again at 11:15 A. M. 8/11.

At 1:20 A.M. 8/15, the pressure in K-301-4.5 increased sharply and the cell was immediately isolated. At 1:30 A.M., K-301-4 was isolated. The source of the inleakage was not determined, but it was determined that the inleakage was G-74. The cascade was split between K-302-5 and K-303-1 for one hour to remove the G-74 from the lower section of the cascade. Three cells of G-74 were collected in K-302-5; one of which contained 50% G-74; the other two contained approximately 100% G-74. K-301-4 was run on total reflux until 6:45 A.M. 8/15 to collect the G-74. It was then placed back in the cascade.

On 8/15, all buildings of Case V were placed in the cascade except eleven cells scattered through the buildings which were not ready for cascade operation.

### Section 600

Section 600 operated normally all week with both sets of pumps in operation.

### Variable Frequency Power

The power consumption data collected during the tests in buildings K-301-1, K-303-3, K-303-5, K-303-7, and K-305-4 have been analyzed statistically. The following observations were made:

1. The power consumption per cell in any section was found to vary linearly with the tails pressures.
2. The power consumptions of cells in a building were found to vary as much as  $\pm 36$  per cent from the mean power consumption per cell in the building, while the power consumptions of buildings in a

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W. J. Dwyer  
Technical Information Officer

section were found to vary as much as  $\pm 9$  per cent from the mean power consumption per building in the section. The above deviations were calculated at the 95 per cent certainty level.

### Seals

A test program is being prepared for the solution of the following principal problems relating to seals and seal systems.

1. The best operating conditions for normal seals.
2. A means of detecting faulty seals.
3. The best operating conditions for faulty seals which must be operated during an emergency period.

No suitable hygroscopic material has yet been found which can be inserted in the seal exhaust lines as a trace indicator for high water vapor content. An investigation of specially prepared silica gels manufactured by the Davidson Chemical Co. is planned, however.

The dew point of the seal exhaust gas in Cell 1 of Building K-305-4 was determined and found to be  $-15^{\circ}\text{F}$  (referred to atmospheric pressure and  $120^{\circ}\text{F}$ )

### 312 Buildings

A series of tests for building K-312-3 has been prepared and the first tests are now underway. Preliminary data on the separation performance and purging capacity of the cascade under various operating conditions were obtained.

It was found that with a bottoms G-74 concentration of 15 mol per cent, 18 active cells, the feed point at cell 5 and a purge rate of 1660 scf/day, that the top C-616 concentration was about 0.008 mol per cent.

### G-74 Inleakage

A nomograph for determining the inleakage of G-74 to building by a consideration of the design upflows and the line recorder G-74 readings on the top cells in the buildings was prepared and distributed.

### Motor Operated Valves

An investigation of the proper settings of the overload current relays in the motor operated valve circuits is underway.

### Cascade Purging

Table I gives the purge rates for the past week at both the 303-10 and 305-12 purge points. Analysis of the purge gas for the period from 7/30 to 8/7 are also included. During this time the gas leaving the cold traps had the following average compositions:

	<u>mg T/cu.ft.</u>	<u>Vol % O<sub>2</sub></u>
K-303-10	25	0.5
K-305-12	37	2.1

### Recovery Room Operations

From 8/3/45 to 8/17/45 the recovery cold trap rooms were utilized to service 30 cells. Miscellaneous uses included the purging of the exhaust gases from the mobile 600 unit and the evacuation of the A and B spare lines, evacuation headers, and return lines which were necessary for normal operation. Twelve out of the 30 cells which were serviced had just come off stream for repairs. Four cells, running on inverse recycle were evacuated to remove G-74 or air from the cascade.

During this period of time, the average evacuation of a cell coming off stream held up in the recovery equipment 16.6 lbs. of C-616 for 25.6 hours.

The following tabulation gives the percentage of cells serviced per day and the fraction of inventory off stream due to recovery.

<u>No. of cells Evacuated</u>	<u>Possible Cell Days</u>	<u>% Serviced Per Day</u>	<u>% Inventory off stream due to recovery</u>
12*	5552	0.22	0.037
18**	-	0.32	-

\* Cells coming off stream for repairs.

\*\* Cells serviced with recovery equipment other than those just coming off stream for repairs.

### Valley Iron "R" Pump

311-1 The Bellows seal "R" pump has been operating satisfactorily all week with no trouble. The loop is still charged with G-74, with the throttle valve wide open. This bellows seal pump has now passed 2000 hours of operation with the same bellows. Running time to 8:00 A.M. 8/18/45 - 2115 hours.

310-3 The carbon seal pump was shut down at 3:44 A.M. 8/15/45. The motor kicked out several times due to overload. The operators reported that the seal was squeaking. The seal was dismantled, and the carbon rings were found to be in excellent shape, with evidence of only traces of powder. The seal will be reassembled with new P-8 Miller Polymer rings.

Running time to shutdown - 314 hours 40 minutes.  
Seal inleakage at shutdown - 0.03 scf/hr.

312-1 These two carbon seal pumps are still dismantled. It was tried to put these pumps in operation, but it was found that the pistons were rubbing and alignment of parts was poor. The pumps were again dismantled for inspection.

TABLE I  
CASCADE PURGING

Date	K-303-10			K-305-12			Total Rate scfd
	Rate scfd	Analysis mg T/cu.ft. Mol % OA		Rate scfd	Analysis mg T/cu.ft. Mol % OA		
7/30	2300	-	-	0	-	-	2300
7/31	3000	2017	0.2	0	-	-	3000
8/1	1848	700	0.7	658	-	-	2500
8/2	1500	145	0.2	560	1860	0.0	2060
8/3	1330	67	1.7	365	24	1.2	1695
8/4	1400	214	4.6	900	388	4.6	2300
8/5	1212	214	1.4	400	213	0.6	1612
8/6	1469	90	1.0	300	360	1.1	1769
8/7	2000	300	1.5	1100	300	0.2	3100
8/8	1360			500			1860
8/9	1800			500			2300
8/10	2070			470			2540
8/11	1225			410			1635
8/12	310			325			1135
8/13	1000			430			1430
8/14	1500			510			2010

#### Coolant System

An examination 8/17/45 of the coolant cooler of Cell 2, Building K-303-3 (on stream since 4/12/45) revealed the following:

1. The shell was slightly corroded and will require a sand cleaning.
2. The tube bundle was covered by a light layer of silt.
3. A small built-up of mud settled on the water baffles.
4. There was little corrosion at the cast steel head.

Since this cooler was in better condition than any cooler examined previously, it can be concluded that Carbide's present procedure of flushing through the 1" plug on the bottom is adequate.

All coolant valves packed with either butyl or neoprene rubber were tight when checked during the week of 8/6/45. The data collected is summarized in the following table:

TABLE II

<u>Bldg.</u>	<u>Number of Cells</u>	<u>Type of Valves</u>	<u>No. of Valves</u>	<u>Type of Packing</u>	<u>Date Packed</u>
K303-6	1	4" Discharge	1	Butyl Rubber Rings	Apr. 24, 1945
K304-4	1	1½" Chapman	1	Neoprene Strip Rubber	July 10, 1945
K304-5	8	1½" Chapman	8	Neoprene Strip Rubber	July 10, 1945

TABLE II (continued)

Bldg.	Number of Cells	Type of Valves	No. of Valves	Type of Packing	Date Packed
K305-10	9	1½" Chapman	9	Butyl Rubber Rings	July 27, 1945
K305-10	9	½" Chapman	11	Butyl Rubber Rings	July 27, 1945
K305-10	1	3/4" Chapman	1	Butyl Rubber Rings	July 27, 1945
K305-10	4	4" Discharge	4	Butyl Rubber Rings	July 27, 1945
K306-4	14	1½" Chapman	14	Neoprene Strip Rubber	August 1, 1945
K306-4	14	½" Chapman	42	Neoprene Strip Rubber	August 1, 1945

Carbide is planning to remove the dry air blanket from surge drums since:

1. I.R. analyzer tests reveal leakage, even at low blanket pressures, at the pump shaft packing gland.
2. A test of cells operating without the coolant blanket showed no appreciable change in the normal increase in inertness and per cent water.

The data to support Carbide's contentions is yet to be turned over to Kellogg, but some preliminary results appeared encouraging.

#### Valves (Polymer Seated Valves)

An examination of Crane G-17-AP valves (five 12" and two 14") chosen at random from a shipment to the site, revealed the following:

1. All valves were contaminated by dirt and aluminum slivers and leaked badly initially.
2. One was found with grease on the seats.
3. Two 12" valves had leaky bellows.
4. Both 14" valves leaked very badly after the seating tubes were scuffed during valve closure by the aluminum retaining rings at the disks.
5. Three 12" valves were tight after cleaning procedure.

#### Crane G-17-AP Adhesion Study

The following preliminary data has been obtained on the study of the adhesion of Firestone seats. All the tests were made with 6" valves equipped with the light colored rubber:

1. A valve tested as shipped from Crane showed no adhesion after 15 days at 75 to 100 ft. lbs. torque and moderate compression set.
2. A valve tested as shipped from Crane showed no adhesion after 15 days at 135 to 150 ft. lbs. torque, decided compression set, and cutting of both seats in several places at the top of the disk groove.



3. The seats of a valve, to which monel reducers had been welded with the valve ports open, did not adhere to the seating tubes after closure was maintained at 67 to 100 ft. lbs. for 15 days. The seats became slightly darker in color and showed considerable compression.
4. New light-colored Firestone seats were installed in a valve which was torqued to 30 ft. lbs. and maintained for 14 days. There was no adhesion, very slight discoloration, and slight compression of the seats.

#### Ambient Air

Work has been started this week with Mr. Gershon of the Pritchard Company to improve the Dew Point of the air leaving the Hydryers.

To date, the following has been accomplished:

1. The flow to both upper and lower beds was balanced by resetting the dampers (draft gauges were installed).
2. A Dew Point of  $-60$  to  $-68^{\circ}\text{F.}$  was obtained with 10,000 s.c.f.m. recirculated air and 6,000 s.c.f.m. make-up air.
3. A Dew Point of  $-64^{\circ}\text{F.}$  was obtained with 22,000 s.c.f.m. recirculated air and 12,000 s.c.f.m. make-up air.  
(2 and 3 indicate that the Dew Points are independent of flow, but are sub-specification).
4. No difference in Hydryers could be found. The same inlet air was sent simultaneously through one Hydryer of each hydryer pair with the following results:

<u>Hydryer</u>	<u>Dew Point <math>^{\circ}\text{F.}</math></u>
Case I (#1 and #2)	-47
Case II (#3 and #4)	-53
Case III (#5 and #6)	-53
Composite	-53

5. Hydryer #5 was entered for inspection after the beds had been regenerated and cooled. Bed temperature was very uneven. The alumina was packed very loosely at the inner and outer peripheries of the beds. Extensive channeling is suspected.
6. Joints on the inner lining and the piping were examined and found tight.
7. The metal seated R. & S. valve on the bed cooling line of Hydryer #5 leaked badly when closed because of a large gap of approximately .040" at the hinges. Unless Carbide closes another valve which is in series with this valve, a skirt will be installed.
8. A composite sample of alumina was taken from the beds of the #5 hydryer. Its appearance was good, but the material will be checked for its adsorption efficiency. The other Hydryers will be checked later.

9. Plans have been made to pack the alumina in the Hydrier #1 to a bulking value of about 50 - 60 lbs./cu.ft. Hydrier checks will then be made. If this procedure improves the Dew Point, similar work will be done on the other Hydriers.

#### G-74

The consumption of G-74 has continued to decrease the past week with an accompanying increase in Dew Point. It was noted that the Dew Point of the G-74 in the tank car was  $-114^{\circ}\text{F.}$ , but when it reached the process area, it had reached  $-68^{\circ}\text{F.}$  An investigation is being made to find the source of water pick-up.

#### Analytical

##### C-216 Disposal Tower

Analyses of the solution in the caustic tower and the settling tank in the C-216 disposal unit have been made for the past month.

67 analyses of the solution in the caustic tower averaged 7.8 mg. of T/liter, with a range of values 0 to 24 mg. Two high analyses of 43 and 89 mg. T/liter were reported on 7/27/45 and 7/30/45 with 8 low results between them.

Five sets of analyses on the settling tank seem to indicate that the C-616 is settling to the bottom. No new C-616 charges appear to have entered the tank because the top sampling point has gradually decreased from 1.8% to 0.4%.

The above analyses are continuing at the rate of one/day on the solution and two sets per week on the sludge tank. This frequency should be adequate to detect any sudden C-616 charge that might accidentally be sent from the plant.

##### Special Analytical Units

##### The "freeze-on" OA analyzer

HF percentages by this method have been determined over a period of six days at the line recorder station of 305-12. The results show consistency, in that all values thus far reported show between 0.3 and 0.7 per cent HF.

Other OA analyzers will be tested this week.

##### Space Recorder

The space recorder has been on operation for three days. The results obtained appear reasonable but are currently being checked by chemical analyses.

##### Contamination of Plant Product

It has been reported by T. E. C. that some new impurity has recently been discovered in the K-25 product. Carbide and Carbon is at present attempting to ascertain the nature and extent of the contamination.

2529

ChemRisk/Shonka Research Associates, Inc., Document Request Form

(This section to be completed by subcontractor requesting document)

~~Requestor~~ J. Lamb / 1034A  
Requestor Document Center (is requested to provide the following document)

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Date document received

Signature

**SANTITIZED VERSION OF THE KELLEX CORPORATION WEEKLY PROGRESS  
REPORT PROCESS ENGINEERING GROUP REPORT DATED 6/30/45**

**(SANTITIZED VERSION OF CRD DOCUMENT # KZ-3211)**

**Compiled by  
S. G. Thornton  
Environmental Management Division  
OAK RIDGE K-25 SITE  
for the Health Studies Agreement**

**December 21, 1995**

**Oak Ridge K-25 Site  
Oak Ridge, Tennessee 37831-7314  
managed by  
LOCKHEED MARTIN ENERGY SYSTEMS, INC.  
for the U.S. DEPARTMENT OF ENERGY  
under Contract DE-AC05-84OR21400**

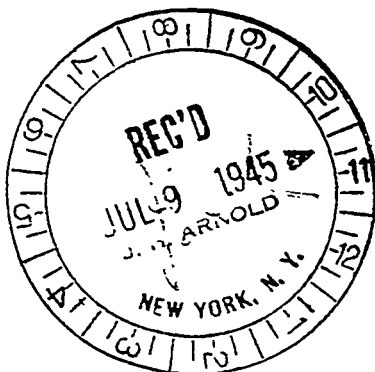
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*DJ Kortman* / *sgt* 3/1/16  
Information Officer  
Oak Ridge K-25 Site

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THE KELLEX CORPORATION

WEEKLY PROGRESS REPORT

PROCESS ENGINEERING GROUP AT SITE

Remains CRD	
Classification changed to	(level and category)
ADC or ADD signature (first reviewer)	12/1/95
ADD signature (final reviewer)	NR
Date	

REPORT NO.

KZ 3211

June 30, 1945

~~RESTRICTED DATA~~

~~This document contains Restricted Data as defined in the Atomic Energy Act of 1954. It is to be controlled, disclosed, and destroyed in accordance with the provisions of the Atomic Energy Act of 1954 and the Atomic Energy Regulations.~~

Section 600

On 6/23, Section 600 was operating on cascade with the east set of booster pumps. The west set was down for a seal replacement on J-602-3A.

The east set continued operating on cascade until 6:00 A.M. 6/27, when the pumps tripped out because of a burned out pump bearing and a seal failure on the Elliott pump J-602-3. The pumps were started again at 3:00 P.M., 6/27, and section 600 was placed back on cascade at 3:45 P.M.

At 9:35 A.M., 6/28, the east set of pumps tripped out because of an overload on the A.C. pump J-601. The pumps were started again at 10:30 A.M., and the section was placed on cascade at 2:00 P.M.

The west set of pumps was started at 2:05 P.M., 6/26, and run for 40 minutes before being shut down due to a seal failure on J-602-3A. The pumps were started again at 7:10 P.M., 6/27, but had to be shut down four hours later in order to repair a lube oil leak in J-602-3A.

At 1:00 A.M., 6/28, the west set was started again and ran for three minutes when the seal on J-602-3A pump failed. The pumps were started and connected to the cascade at 2:25 P.M., 6/28.

At 2:00 P.M., 6/29, Section 600 was connected to the cascade with both sets of booster pumps in operation.

Operations

No major leaks to process occurred during this past week June 23 to June 29. Until June 28th the pocket of C-816 which had leaked into process stream on 6/17 had not moved appreciably up or down cascade. Since a block to the flow of C-816 appeared to be located at the K-301-4 building, it was decided to isolate this building from the cascade and to test its separation performance on C-816 and C-616 mixture. At 3 o'clock on 6/28 therefore, this building was isolated and run on direct recycle for about four hours. During this period the building was constantly scanned by the line recorder. The building was then placed on inverse recycle in order to completely mix its inventory. After approximately 45 minutes operation on

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inverse recycle the building was again put on direct recycle and again scanned for 816 concentration. Result of both these runs on direct recycle checked favorably and the test indicated that barrier present in this building tends to separate C-816 and C-616 mixture in a direction opposite to that anticipated theoretically. The following table summarizes the average concentrations obtained at stage 6 in the on-stream cells. Wherever possible the concentrations measured were checked by scanning the 2 peaks on the line recorder used to measure C-816 concentration, that is, the mass 31 peak and the mass 69 peak.

Summary of Separation Performance Barrier in K-301-4 on C-816 and C-616 Mixture.

Cell No.	Average C-816 Concentration	Approximate B Value (Average Between cells Indicated)
3	.058	
5	.18	
7	.88	
8	2.44	
6	8.33	
2	21.8	

Overall B Value

The above results indicate that barrier in K-301-4 was probably responsible for holding the C-816 in the cascade.

Plugging

Table I summarized data taken on the plugging barrier in building 303-6, cells 9 and 10. No change has been noticed in the WB Barrier present in building 301-4 since last week. Data presented for the in calls 2, 4, and 6 of building 301-2 indicate that no appreciable plugging has occurred in this building for the past three weeks.

An attempt was made to "unplug" the barriers in call K-303-3.1 for the past 14 days by reconditioning.

At the end of the reconditioning period a test was run to determine the effect of the refluorination. It was not felt advisable to put the cell on stream for this test, since this would involve opening cell block valves, the seats of which could possibly have become damaged due to the severe running conditions during reconditioning. The results of the test, while not entirely satisfactory, indicated that in general, no improvement in barrier porosity due to the reconditioning. It was decided, therefore, to remove all diffusers from this cell and replace them.

At the present time, cell K-301-4.4 is still being reconditioned.

Measurements in the control valve positions will be taken when the cell is put on stream.

#### Line Recorder

The tube-rack assembly shop produced 14 machines this week by virtue of extensive overtime. Most of these have been installed in 304 and 305 just in time to meet operation dates.

The Instrument Department Accuracy Committee started off enthusiastically on 6/18 and has now freshly calibrated one tube rack in almost every building.

There is perhaps no one available here who has the necessary experience to discover and correct all of the fundamental causes of drift in sensitivity in less than two months time, but the work is going ahead slowly. If more speed is considered advisable, an experienced man from Nier's laboratory should be sent here for one month's stay.

Much of the LR operations Department's attention this week was taken up with the mysterious "816" pocket in the plant. Despite early suspicions, all checks have upheld the validity of the line recorder data.

#### Examination of Plugged Mist Filter

On 6/27, a plugged mist filter in the recovery room in building K-302-5 was cut out to be inspected. Prior to its removal, it had a pressure drop of \_\_\_\_\_ when the pump was running at \_\_\_\_\_ suction pressure, and \_\_\_\_\_ suction pressure. An unsuccessful attempt was made to unplug the mist filter by blowing G-74 at a 25 psig countercurrent to normal operating flow.

The end cover of the mist filter was removed, and on the inside surfaces of the secondary expansion chamber was found a paste of a greenish solid in MFL oil about 0.1" thick. On removing the nozzle plate, a mixture of a green and yellow solid deposit was found on the nozzle screen and in the nozzle wool. This solid was probably a mixture of  $TF_4$  and  $TO_2F_2$ . The nickel plate was a deposit of the same type of material present in the nozzle wool. This was probably caused by the blowing back of the solid while attempting to unplug the filter. Traces of solid deposit was found in the wool adjacent to the baffle plate. This deposit probably centrifuged out of the gas stream around the periphery of the baffle plate. There was no evidence of further deposits in the barrel of the mist filter.

A sample of the green slurry, and a portion of the nozzle wool was taken for analysis.

It is quite evident that the source of the plug was at the throat of the venturi nozzle where the solid deposit was caked and entrapped in the nickel wool.

### Cold Trap Systems

From 6/23 to 6/29, the evacuation of 6 cells which were running in cascade were carried out. All 6 cells were isolated from the cascade and evacuated with the stage pumps to approximately 0.2 psia before using the cold traps.

On 6/27, building K-304-1 and 2 were evacuated successfully by the cold traps in the recovery room in building K-302-2. The buildings were valved together and running on direct recycle. G-74 was bled in at the suction of the Beach-Russ pumps in the recovery room keeping the suction pressure of the pumps at 0.5 psia. When the buildings to be evacuated were connected to the vacuum pumps the suction pressure was then increased and controlled at

### Carbon Traps

As of 6/30/45, the inventory on hand of carbon and alumina mixtures are as follows:

Type Carbon	Type Alumina	Volumetric Ratio-Carbon to Alumina	Weight on Hand
6-8 Mesh	6-8 Mesh Cadmium coated	1½ - 1	6930#
6-8 Mesh	6-8 Mesh Plain Alumina	1½ - 1	9000#
6-8 Mesh	2-4 Mesh Plain Alumina	2 - 1	12000#

These mixtures were prepared using Kallrex Specifications at the Carbon Mixing Plant. Operation of the plant started approximately on 6/10/45.

### Valley Iron "R" Pump

All "R" pumps under test have been operating satisfactorily during the past week. Pump #110 (Carbon seal) in Building K-310-3 was shut down for six hours 6/27/45 to install rotameters in the seal feed and exhaust lines for a visual check on flows. Pump #110 (Bellows) in Building K-311-1 was shut down 6/25/45 to install an additional Burris Booster (4") in the suction line of the test loop. The pump is still down pending vacuum testing, but should be started today (6/30/45). All four pumps in Building K-312-1 have been operating with no trouble. No change in operating conditions has been made.

Running times of pumps to 8:00 A.M. 6/30/45 are:

K-311-1 (Bellows) - C-616	1010 hrs. 53 mins.
Total	1056 hrs. 38 mins.



K-310-3 (Carbon)

319 hrs. 16 mins.

The seal inleakage rate has risen from 0.025 scf/hr. as reported last week to 0.05 scf/hr. Seal chamber temperature has dropped to an average of

K-312-1	Pump #1 (Bellows)	899 hrs. 58 mins.
	Pump #2 (Bellows)	630 hrs. 39 mins.
	Pump #3 (Carbon)	277 hrs. 5 mins.

Seal chamber temperature (Showing slight increase)

Pump #4 208 hrs. 53 mins.

### Purge Cascade

Building K-312-3 All odd number cells have now received preliminary vacuum testing and have been found satisfactory.

Cells #6, 8, 14, 20 Preliminary test O.K.  
Cells #2, 4, 10, 12, 16, 22 Still under test  
Cell #18 Changing bellows clips  
Cold trap room Preliminary test O.K.

K-312-1,2 Still under construction

In changing the bellows clips in 312-3, it has been found that careless workmanship and careless storing of bellows has resulted in damage of the existing bellows. This damage consists of dents in the bellows convolutions. These small dents are being passed by Jones and Hamilton inspectors. However, based on the experience gained on the failure of Pump #2, Building K-312-1 due to a dented bellows, it seems unwise to allow a dented bellows to be put in service in the cascade. Life of bellows would be uncertain, and definitely shortened.

### Ambient Air

An experiment was run to determine the heating performance of the pipe casing in K-304-3. A report including performance curves was sent to Mr. P. B. Gordon.

The test showed that the temperature in the cell by-pass casing began to level off 160°F., about eight hours after the heaters were turned on. The building by-pass casing temperature rose to the maximum set for this test (160°F.) in six hours.

Dew points in Sections -3 and -2 have remained consistently between -30 and -40°F. All other sections have been running satisfactorily.

### Dry Instrument Air

The carbon rings in all four Worthington compressors have been changed once to date. The rings were initially 1 1/4" thick and at the time of removal were about 3/4" thick. It is estimated that 300 cu. in. of carbon or 20 lbs. (assuming a density of 2 for carbon) wore off and subsequently went into the systems.

New filters will be installed upon arrival at the head of Buildings 304-4 and 5 and 305-4 to remove any solids entrained in the dry instrument air streams.

### Coolant System

In the buildings of Sections K-305 and K-306, some of the coolant pumps are being dismantled for repair work on the shafts. Upon taking the impeller housing apart, large amounts of metal chips or welding slag is being found. No definite source has as yet been established for this material, although it is believed to come from the piping that is connected to the circulating pumps. It is probably blown there during pressure tests. If allowed to remain in the systems, this could become a source of much trouble.

The dry air blanket has been removed from cells 2, 3, 7, and 10 in building K-303-3. This was done to test the effect of eliminating the air blanket on the properties of the coolant. The above test has been running for about two weeks. Samples of C-816 were taken before starting this test and several times during the test period. As yet, no data has been received from the laboratory;

Cell 10 of Building K-302-3 is running again and the coolant for this system is being watched closely to observe any bad leaks. The average loss for this cell per day is running between 3.5 and 4.5 pounds.

In Building K-303-1, cell #6 was evacuated and the coolant dropped on Monday, June 25, 1945. This was done to repair a leaking weld. The leak occurred where the four inch header is welded to the two inch header leading to stage one. The leak has been repaired and the cell returned to cascade operation.

### Valves

The leak testing group has found five badly leaking valves in the past week. The valves are in the non-operating 306 section. The following table gives the valves and their leak rates:

<u>Hldg.</u>	<u>Valve</u>	<u>Torque</u>	<u>Type*</u>	<u>Leak Rate - m.c.f.h.</u>
K-306-1	AX-2	100 ft.lbs.	G-17-AFM	$1.9 \times 10^5$
K-306-1	BP-2	100 ft.lbs.	G-17-AFM	$6.5 \times 10^5$
K-306-2	BK-2	100 ft.lbs.	G-17-AFM	$3.6 \times 10^5$
K-306-2	BK-1	100 ft.lbs.	G-17-AFM	$3.2 \times 10^6$
K-306-2	AX-2	100 ft.lbs.	G-17-AFM	$1.6 \times 10^5$

\*G-17-AFM - Double-seated gate valves containing Firestone Rubber Seats, installed in the field by Midwest Piping.

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The valves are going to be dismantled and have the seats changed before the building is turned over to operations.

Five pairs of discs with P-10 seats were assembled and installed in 4" G-17A valves for use in a special unit. When the valves were closed cold to 150 foot pounds torque and leak tested, the leak rates of the seat ranged from 50 m.c.f.h. to 1990 m.c.f.h. After the valves were baked in an oven while closed to 150 foot pounds torque at 180°F., for 17 hours, the leak rates of the seats ranged from 0 m.c.f.h. to 3.8 m.c.f.h.

Examination of the valves showed that eight out of the ten discs were making metal to metal contact on the sides of the valve bodies. Attempts are being made to find the cause of this contact so that it may be corrected before large shipments of discs begin arriving.

#### Analytical

A list of the C-616 feed to the K-300 plant for the period 5/5/45 to 5/25/45 was compiled. During this period, 92 cylinders, containing a total of 41,400 lbs. C-616 and 4,509 lbs. O.A., were introduced.

A sample of the cell gas from 303-10 cell #4 has been sent to Dr. Nash for special analysis.

C. A. Johnson  
C. A. Johnson

CAJ:ca

TABLE I

SUMMARY OF BARRIER PLUGGING

Date	CV Positions (% Closure)				in K-303-6	
	6/1/45	6/8/45	6/15/45	6/22/45	6/29/45	
Cell 9 Stage	1	49	53	43	55	47
	2	48	51	50	50	49
	3	46	47	50	50	47
	4	46	45	48	48	45
	5	43	43	47	45	43
	6	49	48	47	49	40
Cell 10	Stage 1	59	65	65	67	62

to	CV Positions (% Closure)				in K-301-2	
	6/7/45	6/15/45	6/22/45	6/27/45		
Cell 6 Stage	1		47	44		46
	2		46	46		45
	3		42	43		43
	4		48	46		47
	5		45	45		46
	6		46	46		46
Cell 4 Stage	1	46	40	36		41
	3	47	46	46		46
	4	47	47	47		47
	5	42	42	42		42
	6	39	42	40		41
Cell 2 Stage	1	35	36	37		35
	2	45	44	45		45
	3	41	43	42		42
	4	45	47	47		47
	5	42	39	41		40
	6	45	50	48		49

Operating at the control valve positions vary considerably so that definite indications of barriers plugging is difficult to obtain from this source.

## DISTRIBUTION

1. K-25 Site Records (RC)
2. ChemRisk/Shonka Research Associates
3. S. G. Thornton (K-25 EMD)
4. DOE Public Reading Room

**ChemRisk/Shonka Research Associates, Inc., Document Request Form**

**(This section to be completed by subcontractor requesting document)**

~~Robert T. Lamb~~ / 1034A  
Requestor Document Center (is requested to provide the following document)

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Date document received

Signature

**SANITIZED VERSION OF THE KELLEX CORPORATION WEEKLY PROGRESS  
REPORT PROCESS ENGINEERING GROUP REPORT DATED 7/7/45**

**(SANITIZED VERSION OF CRD DOCUMENT # KZ-3212)**

**Compiled by  
S. G. Thornton  
Environmental Management Division  
OAK RIDGE K-25 SITE  
for the Health Studies Agreement**

**December 21, 1995**

**Oak Ridge K-25 Site  
Oak Ridge, Tennessee 37831-7314  
managed by  
LOCKHEED MARTIN ENERGY SYSTEMS, INC.  
for the U.S. DEPARTMENT OF ENERGY  
under Contract DE-AC05-84OR21400**

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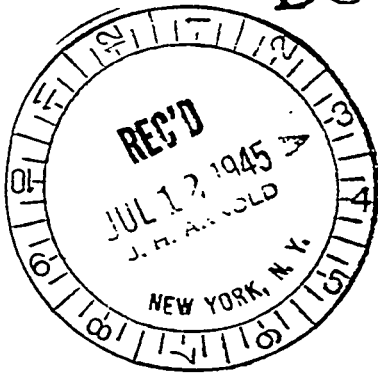
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Public Information Officer Date  
Oak Ridge K-25 Site

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THE KELLEX CORPORATION

960

July 11, 1945



WEEKLY PROGRESS REPORT

PROCESS ENGINEERING GROUP (AT SITE)

Period 7/7/45

REPORT NO.

K-3212

Section 600

Operations in Section 600 proceeded normally during the week except for a period of two hours on 4/7/45. At that time the electrical department cut off one transformer in the 600 building causing the pumps in Section 600 to stop. The pumps were put back on stream within an hour and the disturbance in the cascade was not severe. The reason for these pumps stopping as a result of cutting out the transformer has not yet been explained. However, the design of the plant should have been such that removing a transformer from the system would not shut down the section.

74 Separation

Building K-311-1 was isolated from the cascade and run on direct re-cycle during July 2 and July 3 to determine its efficiency as a 74 separator. Under total reflux conditions, the estimated B-value between 95 and 100 mol% 74 was found to be

Assay Test

The following table summarizes the separation performance data obtained

<u>Date</u>	<u>Building Number</u>	<u>Type of Barrier</u>	<u>Operating Pressure, Psia</u>	<u>Average Separation Factor</u>	<u>Deviation</u>
6/22	K-301-4				
6/23	K-301-4				
6/23	K-301-3				
6/24	K-301-3				
6/25	K-304-2				
6/26	K-304-2				

Reviewed by CRD  
Checked by [Signature]  
Date 12 Oct 45  
ABC or ADD Signature (first reviewer) Date



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The deviation noted is the deviation obtained at the 95% certainty level.

A complete report on this data is to be the subject of a OK report in the near future. Due to the size of the calculated deviations, little confidence can be placed in the average separation factor reported. It is apparent that experiments of this type will have to be carried out under more carefully controlled conditions than heretofore if significant results are to be obtained.

### Reconditioning

During the past week reconditioning of cell 4 in Building K-301-4 was completed.

The cell was evacuated on 7/2/45, but could not be returned to the cascade as a leak had developed in the stage 6 converter. The cooler is being replaced at present.

### Leak to Process

At about 2.00 AM cell 3 in 305.3 was evacuated with the stage pumps in preparation for repair. The cell was pressured with 74 above 2 psia and the 4 outlet cell block valve was opened to relieve the pressure. However, the valve feeding 74 was not closed and 74 was fed directly into the cascade. The surge drum pressures in Section 600 increased from the operating value of 12 psia to 22 psia. This increase in pressure corresponds to about 800 lbs. of 616.

The line recorders immediately indicated an abnormally high 74 concentration for that section by going off-scale. About 10 minutes later the 74 supply valve was closed and the leak was checked.

Six vacuum pumps were used to purge the inleakage. Eventually, buildings K-305-3, K-305-4 and K-303-10 (top building of cascade) were practically evacuated. Nevertheless, difficulty was experienced in restoring the C-616 to the evacuated buildings. It was finally accomplished by raising the pressures in a number of the buildings below the evacuated ones.

### Line Recorders

During this week 10 racks were produced without much overtime work. The work appears to be going ahead smoothly.

Seventy-four (74) tube racks are now in place on the operating floor. At this moment 5 of these are being calibrated after initial installation, 10 are down for repairs, and the remaining 59 are in service.

The LR maintenance crew is currently calibrating three or four

-3-  
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machines per day. An attempt will be made to calibrate every machine in the plant every two weeks. Also, Thrumman's group, who have been joined today by Leland and Sgt. Elsner from Nier's laboratory, are continuing research into the causes of sensitivity range. One item so far uncovered is that a great many of the operating tube-racks are showing objectionable current leakage from filament to case.

#### "R" Pumps

The bellows-sealed "R" pump #77 was started at 2:23 p.m. on 7/2/45 after a week's shutdown for installation of new flow measuring equipment. A 4" Burris Booster was installed in the suction side of the pump loop, and the DBI was changed. The pump was started on C-616 and later switched to G-74 for a new set of operational runs to obtain pump characteristics. It was found that the differential pressure was too small to read accurately on the recorder chart, and the impact pressure was poorly recorded because of vibration. Therefore, a butyl phthalate differential manometer and a mercury absolute manometer were paralleled with the recorder. Running time to 3:00 a.m., 7/6/45 -- 1132 hours 53 minutes.

"R" pump #110 was dismantled after 370 hours of operation (Run #5) to inspect the carbon seals. This was after the seal inleakage had risen from 0.02 to 0.07 SCF/hr. On examination, the seals were found to be covered with black powder, identical to that discovered in the first run on pump #110. This powder has been sent to the lab. for analysis.

The powder found in Run #1, in which the seals were made up of P-10 Miller polymer, was also sent to the lab. and found to contain about 7% of T. This indicated reaction with P.G. and consequent disintegration of the rings. This last run was made with rings of P-8 Miller polymer, and they seem to behave in the same way.

Linde has expressed the opinion that the rings should undergo a pre-treatment in P.G. prior to installation in the pump, to condition the surface and increase life.

Run #6 will have rings of P-8 Miller polymer pre-treated with P.G. at low pressure.

#### 312-1

The bellows-sealed "R" pumps in 312-1 (pumps #1 & 2) have given trouble-free operation for the past week, with #1 pump passing the thousand hour mark of continuous operation. Running times to 3:00 a.m. 7/6/45:

Pump #1      1043 hours 53 minutes

Pump #2      774 hours 39 minutes

The carbon seal "R" pumps have also been operating satisfactorily. Seal inleakages have been calculated on these pumps over a period of about

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2 weeks. These test loops were originally set up for mechanical testing, so that they are equipped with 30-0-15 pressure gages. Thus, the inleakage rates quoted are of low accuracy, even though seal feed and exhaust pressures are controlled by PCV's. This stems from the fact that inleakage rates are obtained from length of purge intervals.

Pump #3 (equipped with P-8 Miller polymer rings) shows an average inleakage rate of 0.02 SCF/hr.

Pump #4, equipped with the P-10 rings removed from pump #77 (311-2) after its first run, has an inleakage of 0.06 with definite gradual decrease with running time.

These pumps are running on dry air at a C.R. = 2.0 and suction pressure of 1 psia.

The carbon seals operating on 3-616 have shown a steady increase in seal inleakage rate. Thus, even though the data in 312-1 might be grossly in error, it is interesting to note that the carbon seals operating on dry air show the flow characteristics desired, although the heating of the seal chamber is the same in both cases (seal chamber temp. about 40°C.) It would seem then that attack by P.G. is a greater factor in seal life than high temperatures.

The running time to 8:00 a.m. 7/6/45

Pump #3            330 hours 30 minutes

Pump #4            352 hours 53 minutes

#### Purge Cascade

#### 312-3

All preliminary vacuum testing is now completed on cells and cold trap room. Work is now in progress insulating cells and C.T. room, and changing post clips and trunnions on the "R" pumps. At least 5 bellows are to be replaced because of damage and leaks observed or produced during clip changing.

#### Cold Trap Room Operation

From 6/30/45 to 7/7/45, it was necessary to use the cold trap rooms to evacuate and purge only 6 cells of the total cells taken offstream. All 6 cells were evacuated with the stage pumps, prior to their shutdown, to approximately 0.2 psia.

The 816 in building K-301-4 was removed with the use of the recovery room in building K-302-2. In order to control the gas concentration to the Beach-Russ pumps in the cold trap room, building K-301-4 was connected to the intersectional cell in building K-301-5. 194 lbs. of material was removed from the cold trap.

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~~CONFIDENTIAL~~Cold Trap Capacity Tests

Capacity tests on the #6 cold trap will be carried out in the recovery room of building K-304-1. At present, this recovery room is not ready for operation. Electrical testing is scheduled to be finished on 7/7/45, and conditioning will start immediately thereafter.

Cascade Purging

The pumps of the purge and product room of K-303-10 were calibrated by C & CCC and substantial variation from the Jersey City calibration curve was found. All previously reported values of purge rate are presented, using the new pump suction pressure vs. pumping speed curves.

With present method of cascade purge control, the pressure rise across the OA pump, cell 7 - K-303-10 is held constant by means of a Fulscope controller actuating the CV from K-303-10 intersectional cell to K-303-10 Purge & Product Room. For purge measurement, the pump suction pressure is recorded. Due to erratic variation in pump suction pressures, it is impossible to give accurate values of purge rates.

The following table presents data on purge volumes and OA and C-616 concentrations.

<u>Date</u>	<u>Purge Rate SCF/D</u>	<u>Purge Gas Analysis</u> <u>Vol% O<sub>2</sub></u> <u>mg T/ft<sup>3</sup> (standard)</u>
6/12	4440	"
6/13	5600	238
6/14	4950	5.3
6/15	3659	234
6/16	3150	519
6/17	2400	536
6/18	2280	666
6/19	1200	689
6/20	2520	197
6/21	3300	202
6/22	3450	140
6/23	3050	131
6/24	2750	111
6/25	1200	363
6/26	-	116
6/27	-	664
6/28	0	64
6/29	-	73
6/30	-	25
7/1	1543	268
7/2	1600	103
7/3	2535	-
7/4	2155	-
7/5	2170	-

Up to 6/26, all data is up to 8:00 a.m. of the previous

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day. After 6/26, the figure reported is from 12:00a.m. to 12:00 midnite.

### Valves

(Crane, G-17-A Type)

The following valves were opened and the seats changed this past week:

K-306-1	AX-2	K-306-2	BX-1
K-306-1	BP-2	K-306-2	AX-2
K-306-2	BX-2		

These valves were reported last week by Pvt. R. Battistella as having seat leakages higher than specifications. All valves contained Firestore rubber seats installed in the field by Midwest Piping.

Examination of the seats revealed that one of the rubber seats in each valve had been pulled out of groove, thus preventing proper closure. The cause of the seats being pulled loose is unknown.

The five 4" Crane G-17 valves, that were fitted with P-10 seats for a special unit, were dismantled and examined carefully. The special discs fitted perfectly in two of the valves, made slight body contact in two others, and didn't fit the fifth at all. A new group of discs were received, and one still gave body contact. Measurements are now being taken to check clearances and tolerances for the new type discs, in order to make sure the discs that will be coming in will fit the valves already in process lines.

Three more building valves have been discovered with excessive leak rates.

<u>Building</u>	<u>Valve</u>	<u>Ser.No.</u>	<u>Ft. Lb. Torque</u>	<u>MGPH Leak Rate</u>
K-306-4	B Normal Inlet	165	100	$9.4 \times 10^4$
K-303-6	" Spare Inlet	156	100	$7.5 \times 10^4$
K-312-2	Spare Return to K-304-5-6	1559	85	$3.5 \times 10^4$

### Lube System

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An examination of two A.C. pumps in K 303-7 showed the following data:

<u>Cell</u>	<u>Pump</u>	<u>Flow g.p.m.</u>	<u>Load Bearing Temp. Rise ° F.</u>	<u>Thrust Bearing Flow g.p.m.</u>	<u>Temp. Rise ° F</u>
8	1A	0.950	16	0.633	12
9	1B	0.592	11	0.396	19

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Specifications for the Lube system agreed on 3/1/45 are as follows:

	<u>Load</u>	<u>Thrust</u>
Orifice Diameter	3/32 inches	9/64 inches
Lube Oil Flow - 8 g.p.m.	0.38	0.85
Temperature rise - F	16.7	20.6

The data shows that the thrust bearings are not getting the specified flow of oil, while the load bearings are getting excessive lubrication. Carbide has been advised to check the orifice sizes when the cells are shut down.

#### Coolant System

On June 29, 1945, Cell #5 of K-309-1, was evacuated and the coolant dropped, in order to repair some leaks in the coolant circulating pump.

A water failure occurred on June 30, 1945, at 8:a.m. in building K-311-1, which necessitated evacuating the cells of the building. The main building water header had become plugged with pieces of bituminous pipe coating. The plugging occurred at a 45° bend where the water header enters the building, and was finally broken by ramming a 2/8" iron pipe into the plug until it gave way. At about 1:00 p.m. the plug was broken and approximately two barrels of pitch were removed from the water header. The building was put back onstream later in the afternoon.

Some results have been received from the laboratory on the status of Cells 2, 3, 7, and 10 in Building K-303-3. These four cells have been running without the air blanket. The following table lists the water content and inertness of these cells. The inertness in all cases has increased slightly and the water percentage has shown a trend upwards. More data will be obtained by removing the blanket of an entire building and running for longer periods.

#### Analyses of C-816 in K-303-3

<u>Initial analyses</u>			<u>After Blanket Removal</u>			
<u>Cell</u>	<u>6/13</u>		<u>6/23</u>		<u>6/28</u>	
	<u>Mol% Water</u>	<u>Weight % Inertness</u>	<u>Mol% Water</u>	<u>Weight % Inertness</u>	<u>Mol% Water</u>	<u>Weight % Inertness</u>
2	0.025	0.189	0.039	0.189	0.042	0.234
3	0.021	0.156	0.021	0.157	0.036	0.207
7	0.046	0.180	0.011	0.179	0.053	0.191
10	0.042	0.132	0.017	0.158	0.031	0.183

*C. A. Johnson*  
C. A. Johnson

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K/EM-345

**SANITIZED VERSION OF THE KELLEX CORPORATION WEEKLY PROGRESS  
REPORT PROCESS ENGINEERING GROUP REPORT DATED 7/14/45**

**(SANITIZED VERSION OF CRD DOCUMENT # KZ-3213)**

**Compiled by  
S. G. Thornton  
Environmental Management Division  
OAK RIDGE K-25 SITE  
for the Health Studies Agreement**

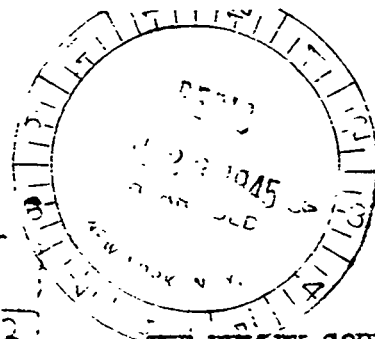
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Series A.

THE KELLER CORPORATION

WEEKLY PROGRESS REPORT  
PROCESS ENGINEERING GROUP AT SITE

REPORT NO.

3213

July 14, 1945

~~RESTRICTED DATA 1945~~

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Section 600

*Remond*  
*CRD*  
(Date and category)  
*12/1/45*  
ADC or ADD signature (last name, first name)  
*MR*

Operation in Section 600 continued uneventfully throughout the past week. The electrical trouble which occurred when a transformer was cut off the line recently was found to be caused by the fact that this particular transformer normally powers the exciter field coil of the M-G sets. Thus when this transformer was shut down the field coil lost its power supply until the selector switch could throw in another transformer. During this time, the pumps lost speed and when the power was resupplied the pumps attempted to regain speed with resulting overload on the pump motors. To eliminate this trouble potential transformers are being supplied to power the field exciter coil off the main bus thus supplying power to the field coil regardless of the transformers in operation.

The weekly report for the period 7/7/45 described a test by the Electrical Department on the operation of the transformers for Section 600. The test was conducted by the Electrical Division of the Carbide Maintenance Group and not the Keller Electrical Department as may have been supposed.

Plugging

The evidence indicates that rather serious plugging has occurred in some stages in Building 303-8. The plugging is believed to have been due to wet air introduced to the process stream through the atmospheric seals. Approximately 98% of the seals in this building were of variety when this building was put on stream. A relatively small number of seals were changed subsequently.

Table I presents the control valve positions for all stages in the building up to 6/30. The percent plug on the Nth stage was estimated from the change in control valve position on the (N + 1th) stage.

A summary of the suspected seals and the repair to these seals is presented in Table II.

The basis for attributing plugging in this building as a result of inleakage of wet air through the seals are as follows:

1. Little, if any, dry air was fed to the atmospheric seals, because the instrument smibbers between the atmospheric seal and the dry air feed had not been removed. This was discovered about July 1, and immediately corrective measures were taken. This fault was in all buildings, other than Case I, therefore, providing a source of wet air to the process.

2. The difficulty of maintaining seal exhaust pressure caused the operators to close or throttle the seal exhaust valve on the AC Pump that had a defective seal to gain stable seal exhaust conditions as recorded on the panel board. When this valve is partially or totally closed wet air can enter the process stream through a defective process seal.

3. Upon replacement of the defective seals, plugging as indicated by control valve position showed no further increase.

#### Line Recorders

Only 30 more line recorders remain to be installed to complete K-25. Dr. Thurman's Accuracy Committee has submitted a report indicating that the chief cause of change in line recorder sensitivity is electrical leakage from filament to ground. Mr. Leland and Sgt. Elsner, who were here this week from Dr. Nier's laboratory, concur in this and have taken some leaky filaments back to New York for investigation. Eleven new model "leak-proof" filaments have now been received from G.E. They will be tried out shortly.

#### Cascade Purging

The following table gives the volume of gas and the concentration of OA and C-616 purged from the plant during the past week:

Date	Purge Rate SCF/D	Mol % OA	mgT/SCF
7/3	2535		228
7/4	2135		75
7/5	2170		127
7/6	2120		40
7/7	2110		44
7/8	2045		256
7/9	1950		121
7/10	2030		69
7/11	2100		---
7/12	1885		---

Analysis have been made for O<sub>2</sub> and CO<sub>2</sub> but there is considerable doubt as to the accuracy of the results and the method is being checked.

#### Purge and Product Room K-303-10

No cold traps plugged during the past week, but operating conditions were drastically changed from those during which plugging occurred. The cold trap temperature was raised to -55°F. and G-74 was added to dilute the purge stream. At the present time the addition of G-74 has been stopped and the refrigerant temperature is being gradually lowered in an attempt to return to the original operating conditions.

### Cold Trap Room Operation

From 7/7/45 to 7/14/45, it was necessary to use the cold trap rooms to evacuate and purge only four (4) cells of the total cells taken off stream.

The cold trap room in K-310-2 was used intermittently for the exhaust gas from the mobile C-616 liquefaction unit.

The recovery rooms in building 301-1 and 310-3 are shut down for repairs. The drain line from cold trap B in 302-1 has been plugged since the room was put in service. The inlet valve to cold trap A in 310-3 has been replaced because of a broken bellows.

Three recovery rooms in section 2B, namely 303-4, 9, 10 are now in stand-by condition. The Recovery Room in 304-1 has been conditioned and trial heating and cooling cycles have been carried out. Capacity tests on the cold traps in this room are scheduled to start on 7/16/45.

### Valley Iron "R" Pumps

311-1 - "R" pump #77 (bellows seal) has been operating satisfactorily on performance test runs. A second set of runs on G-74 has been completed with suction pressures of \_\_\_\_\_ and compression ratios of \_\_\_\_\_. The pump is now operating on pure C-616, with frequent purging and charging to insure purity.

The pump was shut down 7/10/45 because of a suspected leak in the system. On evacuating the loop, it was found that the leak disappeared, and the system was apparently vacuum tight. The "leak" was finally found to arise from a holdup of condensed C-616 in the short length of pipe before the valve in the purge line.

Running time to 8:00 a.m. 7/13/45:

C-616 - 1109 hrs. 38 mins.  
Total - 1282 hrs. 13 mins.

310-3 - Carbon seal pump #110 has been down all week. A new set of P-8 Miller Polymer rings has been pre-conditioned by Dr. Priest's laboratory.

No data was kept on the consumption of C-616 by the rings, but reaction was evidenced by a very thin film of grayish powder. The rings are now ready and will probably be installed by 7/16/45.

312-1 - The two bellows seal pumps in Building 312-1 have been giving trouble-free operation for the past week.

Running times to 8:00 a.m. 7/13/45:

#1 1211 hrs. 58 mins.  
#2 942 hrs. 39 mins.

The two carbon seal pumps were shut down twice during the past week; once for failure of air supply on seal chamber cooling duct, and once for shut down of air for sealing system. On 7/6 the cooling air was cut off, but the pumps were allowed to run. The seal chamber temperature reached a maximum of 58° C. over a period of 5 hrs. before air supply was turned on again. The

average seal chamber temperature  
to 8:00 a.m. 7/13/45:

(Pump #3). The running times

Pump #3 - 495 hrs. 5 mins.

Pump #4 - 517 hrs. 28 mins.

### Purge Cascade

312-3 - Final vacuum testing has begun 7/13/45 on cells at bottom of purge cascade. Bellows chamber evacuation system is also under pre-operational test. First cell is expected to be run Sunday 7/15/45.

### Valves

The preliminary valve testing for the conversion program has been completed except for Buildings K-304-3, 4, 5, K-306-3 and four valves in K-312-3. No leaking valves have been found other than the ones previously reported.

Six 4" Crane G-17-A valves have been fitted with P-10 seats (five of these valves were previously reported as having good leak rates after baking for 17 hours at 180 F. while closed to 150 ft. lbs., but having poor leak rates at room temperature). All six valves were refitted with new discs and on test gave the following leak rates at room temperature:

Valve Serial No.	Torque ft. lbs.	Leak Rates Seat #1	m.c.f.h. Seat #2
162	130	0.1	15.39
157	130	0.04	0.04
161	130	0.00	0.00
120	130	37.3	1.3
160	130	0.24	6.76
159	130	0.10	0.1

The laboratory report on Nordco 852-S lubricant showed it to be chemically acceptable for N<sub>2</sub>O packing. Mr. Hunt, of Carbide and Carbon Chemicals Corp., feels that this lubricant should be used in place of the Nordco 755-S now in use since 852-S is the better of the two for low temperature service.

### Analytical

#### I. Analysis of Caustic Solutions for T Content and X Assay

Samples of the supernatant liquid from the C-216 disposal tower are being taken once every eight hours for the determination of T content and X assay. Over larger time intervals T and X analyses are also being run on the Ca(OH)<sub>2</sub> sludge at four different places along the bottom of the settling tank.

## II. Analysis of C-216 by Sodium Bromide Conversion

A description of the bromide method for C-216 analysis, along with the experimental operating unit used for its calibration has been received and turned over to the Caribde and Carbon laboratories, and these laboratories are now endeavoring to reproduce the accuracy of the results as reported by Dr. T. P. Wilson.

## III. Analysis of MFL from Liquid C-616 Mobile Withdrawal Unit

Specification tests were run on a sample of MFL taking from the Liquid C-616 Mobile Withdrawal Unit #A.

<u>Inertness - 3 Hours @ 212°F.</u>		<u>Average</u>
3.81 wt. %	3.53 wt. %	3.67 wt. %
<u>Vapor Pressure @ 140°F.</u>		
$73 \times 10^{-2}$ mm.	$40.4 \times 10^{-3}$ mm.	$56.7 \times 10^{-3}$ mm.
<u>Viscosity @ 210°F.</u>		
4.48 centipoises		
<u>Acidity</u>		
Positive.		

It was believed that the sample had been contaminated with tetrachlorethylene from a leaking condenser; however, the laboratory analyses did not confirm this belief.

## IV. Colorimetric Determination of T

The accuracy of the Beckmann-Ferrocyanide Method was checked by the laboratories on known samples of C-616 solutions. The results indicate that the method is accurate to five percent, a maximum deviation from the mean of approximately eleven percent.

## Coolant System

Neoprene rubber packing has been installed in nine 1-1/2" Chapman valves of the cell coolant systems, one each in Cell #4 of K-304-4, and in Cells #1, 3, 4, 5, 7, 8, 9, and 10 of Building K-304-5. The packing of these valves, which are on the line connecting the Surge Drum and the Building Supply Header, was accomplished by wrapping the rope around the stem.

The following table lists in detail the manner in which the valves were packed:

- K-304-4 Cell 4 - 2 bottom rings of Merco Nordstrom (755-S) impregnated asbestos. Remaining rings are Neoprene rope packing.
- K-304-5 Cells 1, 3, and 4. Bottom ring of Merco-Nordstrom (755-S) impregnated asbestos. Remainder is Neoprene rope packing.

K-304-5 Cells 5, 7, 8, 9, 10 - Packed only with Neoprene rope packing.

Eight of these repacked valves have been checked with the I.R. Analyzer and found to be tight.

A report has been compiled on the cell coolant losses covering the period from June 21, 1945 to July 11, 1945. On 208 cells recorded, the average loss per cell per day is 4.5 pounds. Fifty-four cells, or twenty-six percent of the total, averaged a loss of 1.8 pounds per cell per day or less. A total of one hundred and five cells averaged a loss of 3.0 pounds per cell per day, or less.

#### Ambient Air

A test was run by Carbide on the performance of Hydryer H-4. Results showed that the dry air produced had a  $-66^{\circ}\text{F}$ . Dewpoint (this figure was checked by two independent groups).

The Hydryers were designed to treat 10,500 scfm. of makeup air with a Dewpoint of  $40^{\circ}\text{F}$ . and 15,000 scfm. of recirculated air with a Dewpoint of  $-40^{\circ}\text{F}$ . and produce 25,500 scfm. of air at a Dewpoint of  $-80^{\circ}\text{F}$ . In the test, 6,500 scfm. of make up air at a Dewpoint of  $20^{\circ}\text{F}$ ., and 10,000 scfm. of recirculated air at a Dewpoint of  $-48^{\circ}\text{F}$ . produced 16,500 scfm. at  $-66^{\circ}\text{F}$ . Dewpoint.

An examination of the data from the Dry Air Plant revealed that, up to 5/10/45, air left the Hydryers at  $-70^{\circ}\text{F}$ . to  $-75^{\circ}\text{F}$ . Dewpoints. Since then the Dewpoints have been about  $-65^{\circ}\text{F}$ . An analysis of the situation, however, will not be possible until more work has been done with the other Hydryers. Present data is being taken with a revised Dewpoint meter which was checked against the old meter. The present ratio of make-up air to recirculation air is no higher than formerly, averaging between 50% to 55%.

The cell ambient air in all sections was again within specifications according to available data. Connoley pop-off valves are being tested and adjusted in all areas.

Piping for the conversion to a dead-end system has begun in Section 3b.

#### Dry Instrument Air

Three of the new Fulflo filters to be installed in Buildings 304-4, 304-5, and 305-4 have been turned over to Mr. Weiland of Carbide who will supervise installation.

#### Plant Air

Construction has begun on converting the Plant Air Supply to the Dry Air Supply System.

G-74

Dewpoints in Section 2 1/2 showed improvement. All sections appeared satisfactory.

The weekly delivery of G-74 to the process area has amounted to about 1,500,000 cu. ft. Of this, only 20% has been traced to known uses.

C. G. Johnson.

CAJ:ca



TABLE I

303-8 Control Valve Position vs. Time

5/15	6/1	6/9	6/16	6/23	6/30	Plug
30	45	41	42	46	44	
45	48	48	50	47	50	
51	54	52	54	55	55	69
46	47	48	47	47	49	11
49	49	49	62	75	78	
49	51	50	52	54	55	
53	52	52	53	56	52	
45	45	45	44	45	44	
47	47	49	49	50	46	
50	51	50	51	51	50	
46	46	46	48	47	47	
48	50	50	50	52	52	60
	43	42	42	40	43	?
	50	51	49	60	74	
	44	35	28	28	31	
	51	50	50	49	52	
	46	47	47	44	47	
	48	47	46	42	47	
	45	43	-	40	40	
	52	52	55	58	50	
	53	54	54	55	52	
	47	46	47	45	43	75
	52	51	53	52	51	
	52	63	81	82	80	
		52	56	57	54	60
45		52	53	53	52	
48		50	53	71	74	
49		55	54	55	55	
52		49	51	52	50	
46		48	50	46	48	
46		55	57	58	56	
48	54	47	47	46	47	17
46	46	50	53	57	57	53
46	51	50	70	69	72	11
49	50	46	54	54	54	
50	48	47	52	50	53	
51	*62	51	48	50	49	
48	35	47	50	48	46	
47	45	52	52	51	53	
50	50	55	55	54	55	
52	53	46	47	46	47	11-44
46	*62	49	49	49	50	
49	43	62	59		60	
55	49	51	50		54	
50	48	51	50		50	
47	51	51	53		51	85
50	53	50	54		48	
50	*64	56	72		89	

TABLE II

Barrier Plugging in Building 303-8

Cell	Stage	% Plug	Suspected Source of Wet Air (Pumps)	Estimated Time that Plugging occurred to 6/30	Operational Facts
1	4	69	<u>4B</u> <u>3A</u>	6/14/45	1. Seal changes -- <u>4B</u> on 6/20
	5	11	<u>5B</u> <u>4A</u>	to 6/30/45	2. <u>3A</u> shows about 60 cc min. on G.E. scanner on 6/15 3. Seal exhaust on <u>3A</u> & <u>5B</u> throttled to control ex- haust pressure on 6/15.
3	0	0	-	0	1. Bad seal <u>6A</u> noted on 6/19 2. Seal exhaust throttled on <u>6A</u> on 6/19/45 3. All seals except 1B re- placed 7/9/45.
5	1	60	<u>1B</u>	6/20/45	1. Seal changes (a) <u>2A</u> , <u>6A</u> on 5/21 to 5/26/45 (b) on 6/16 to 6/22/45 (c) All H-2 seals 7/2/45
			<u>6A</u> of cell 3	6/30/45	
7	5	75	<u>5B</u> , <u>4A</u>	6/5/45	1. Seal changes (a) <u>1A</u> , <u>3B</u> , <u>5A</u> on 5/15 (b) <u>1B</u> , <u>2B</u> , <u>4B</u> , <u>5B</u> , <u>2A</u> <u>2A</u> , <u>3A</u> , <u>4A</u> , <u>6A</u> on 6/16/45 2. Bad seal <u>5B</u> noted on 6/5/45
				to 6/15/45	
8	2	60	<u>2B</u> , <u>1A</u>	6/14/45	1. Seal changes (a) <u>1B</u> on 5/7/45 (b) All H-2 seals 6/25/45 2. Bad seal <u>1A</u> noted on 6/1 3. Seal exhaust throttled on <u>1A</u> to control seal exha pressure on 6/15/45
				to 6/25/45	
6	2	17	<u>2B</u> , <u>1A</u>	6/12 to 6/30	1. Seal changes (a) All seals except <u>1A</u> on 6/25/45. 2. Bad seal <u>2A</u> noted on 6/1 3. Seal exhaust throttled on <u>2A</u> on 6/15/45 to control pressure
	3	53	<u>3B</u> , <u>2A</u>	6/12 to 6/15	
	4	11	<u>4B</u> , <u>3A</u>	6/9 to 6/25	
4	6	11 to 44	<u>6B</u> , <u>5A</u>	6/1/45 to 6/9/45	1. Seal changes - none 2. Seal exhaust throttled on 6/4/45, to control pressure. Pump unknown
2	5	85	<u>5B</u> , <u>4A</u>	6/9/45 to 6/20/45	1. Seal changes (a) <u>1B</u> , <u>4A</u> , <u>6B</u> and all H-2 seals on 6/22. 2. Bad seal noted on <u>4A</u> and <u>6A</u> on 6/14/45. 3. Seal exhaust throttled on <u>4A</u> and <u>6A</u> on 6/15/45 to control pressure.

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REPORT PROCESS ENGINEERING GROUP REPORT DATED 7/28/45**

**(SANITIZED VERSION OF CRD DOCUMENT # KZ-3215)**

**Compiled by  
S. G. Thornton  
Environmental Management Division  
OAK RIDGE K-25 SITE  
for the Health Studies Agreement**

**December 21, 1995**

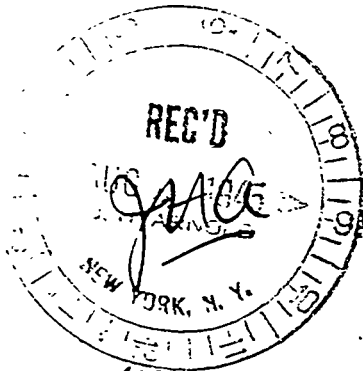
**Oak Ridge K-25 Site  
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This document has been approved for release

*DJ Kortman* / *8/1* 3/1/96  
Plant Information Officer Date  
Oak Ridge K-25 Site

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Series A.



THE KELLOGG CORPORATION

WEEKLY PROGRESS REPORT

PROCESS ENGINEERING GROUP AT SITE

REPORT NO. ✓

KZ 3215

July 28, 1945

## Section 600

Operations in section 600 was discontinuous during the past week. On July 21 pumps J601/602-3 were shut down because the lube oil strainer had become plugged. The pumps were restarted on 7/22 after replacing the seal in AC pumps J601 and operations continued until 1:30 P.M., 7/22. At that time the seal on Elliott pump J602-3 failed and flooded the system with G-74. Section 600 was isolated and then the section was split into two systems each containing one set of pumps. As soon as the section was split pumps J-601A/602-3A tripped out because of overload. Pumps J-601/602-3 tripped out ten minutes later because of overload. Pumps J-601/602-3A which were believed all right were restarted immediately and have operated continuously since then. The seal of Pump J-602-3 was removed and replaced and pumps J-601/602-3 restarted on 7/23 but were shut down an hour later. After trying several seals a good one was finally installed in J602-3 and another start made on 7/24. These pumps could not be evacuated and it was found that there was a leak in the expansion flange on the Elliott pump J-602-3. These pumps were therefore again shut down. It was decided that since the expansion flange had to be replaced it would be advisable to replace the pump also since J-602-3 was installed with a short shaft which interfered with the pump operation. The pump was replaced and a new seal installed. Pumps J-601/602-3 were restarted at 4:40 P.M. on 7/26 and have been running since.

The shutdown of pumps J601A/602-3A on 7/22 is not readily explained. The most plausible explanation seems to be that the failure of the seal in pump J-602-3 flooded both sets of pumps with G-74. This reduced the load on the pumps and the operator in order to control the frequency at the reduced load cut in the field resistance to reduce the field current. When the system was split pumps J-601A/602-3A again picked up their load but since the field had been cut out this was manifested in a drop in exciter voltage and an abnormally high armature current which tripped out the overload switch before the operator could cut out the field resistance and thus increase the exciter voltage. The shut down of pumps J-601/602-3 was probably the result of rubbing of the seal discs which overloaded the pump motor.

Classification (Level and category)

ADC or AEC signature first review Date

ADC signature final review Date

~~RESTRICTED DATA~~  
This document contains Restricted Data as defined in the Atomic Energy Act of 1954. Unauthorized disclosure subject to Administrative and Criminal Sanctions.

Cascade Operations

During the past week, separation performance tests have been continued on isolated buildings running on direct recycle. A summary of the tests completed to date is given below:

<u>Building</u>	<u>Type Barrier</u>	<u>Pressure Levels Tested (PSIA)</u>
K-311-1		
K-301-1		
K-302-4		
K-304-2		
K-304-4		
K-305-9		

Buildings K-306-1 and K-306-7 are to be tested as soon as they become available, on about August 4th.

During the recent leak of C-816 coolant into the process stream, it was observed that separation of C-816 and C-616 similar to that observed with A test was run on building K-304-4, therefore, to determine the effect of temperature on the separation performance of this type barrier, the results of which are summarized below:

<u>Cell No.</u>	<u>Mol % C-816 at</u> <u>92°F.</u>	<u>120°F.</u>	<u>132°F.</u>
3			
5			
7			
9			
10			
8			
6			
B Value			

The above tests were run at a controlled pressure. On the basis of the above data, it appears that the separation factor for C-816/616 mixtures goes through its inversion point (i.e., it goes from a number greater than 1 to less than 1) at a tails pressure for

The results of this test will be summarized in a CK report.

Cascade Purging

The following table gives the volume of gas and the concentration of OA and C-616 purged from the plant during the past week:

Date	Purge Rate scfd	Mol % OA	Mg T/scf
7/16	2340		87
7/17	2600		140
7/18	2560		87
7/19	3260		---
7/20	3190		650
7/21	2280		---
7/22	1850		2258
7/23	1860		---
7/24	2630		---
7/25	2360		---
7/26	1773		---

These analyses are the averages of from 4 to 7 individual analysis per day.

Recovery Room Operations

The table below gives a summary of the operations in the recovery rooms during the period from 7/17/45 to 7/26/45.

No. of Cells Evacuated	Possible Cell days	% Serviced per Day	% Inventory Off Stream due to Recovery
12 <sup>(1)</sup>	3447	0.35%	0.073%
17 <sup>(2)</sup>		0.50%	

- (1) No. of cells coming off stream for repairs that were purged with recovery equipment.
- (2) No. of cells serviced with recovery equipment other than those just coming off stream for repairs.

One recovery room operated intermittently for the mobile 600 unit's exhaust gas.

Average time C-616 in recovery equipment -- 22 hrs./cell.

Average weight C-616 in recovery equipment -- 20 lbs./cell.



### Cold Trap Capacity Tests

At the present time one capacity test has been made with the #6 Cold Trap. A total of 229 pounds of C-616 was drained from the trap.

The initial plug that occurred in cyclone separation was freed with some difficulty by pressuring up the trap with 25 psi C-74, and the run continued until it was impossible to continue flow even at very low pump suction pressures. All subsequent plugs were found to be in the inlet end of the trap.

A check was made for the presence of HF. condensed in the trap by observing pressure rise during the heating up cycle. It was concluded that there was very little if any HF in the effluent. This was confirmed by laboratory analysis but earlier the laboratory had reported 10% HF.

### Valley Iron "R" Pumps

311-1 - Bellows seal R pump #77 was shut down last week for a plugged C-2144 pump filter. This filter had been in continuous operation for 1212 hours without cleaning. The speed of the pump has been reduced (by the use of a smaller motor pulley) to 550 RPM, for pump characteristic runs at low speeds. The pump is now operating satisfactorily on pure C-616 at this reduced speed.

Running time to 8:00 A.M. 7/28/45

C-616	1254 hrs. 37 mins.
Total	1515 hrs. 34 mins.

310-3 - The carbon seal pump was again dismantled and the F-8 and graphite rings removed. The pump was not run. Prior to operation, a leak up rate was taken on the loop, and the inleakage was found to be excessive through the seals. Another set of rings will be installed.

312-1 - #2 pump (bellows seal) was shut down for about an hour because of low crank case oil pressure. Pump #1 has been operating satisfactorily. It has been found desirable to install a snubber in the pressure switch and oil pressure gauge line to dampen pressure fluctuations in these elements. Tests are now in progress on Pump #2 to determine the proper size or? constriction.

Running time to 8:00 A.M. 7/28/45

Pump #1	1559 hrs. 31 mins.
Pump #2	1301 hrs. 49 mins.

Both carbon seal pumps still down.

Purge Cascade

212-3 - During the past week, Cells 2, 4, 6, 8, 10, 12, and 14 were started and operated satisfactorily on pre-operational runs. Cells 2, 4, 6, 8, and 10 were run as a cascade on direct recycle with G-74, using cells 8 and 10 on inverse recycle as surge capacity. Operation of this system was satisfactory except for minor mechanical difficulties.

Coolant System

In Building K-305-10, 24 valves have been packed with butyl rubber rings. The valve sizes range from the 4" Chapman valve down to the 1/2" Chapman valve. The systems in these buildings were filled with coolant before the entire building coolant valves could be packed with the butyl rubber rings.

All cells in Buildings K-304-4 and K-304-5, which had the 1 1/2" Chapman valves packed with Neoprene strip rubber, have been checked with the I.R. Analyzer and found to be tight.

In Building K-306-4, the 1 1/2" and 1/2" Chapman coolant valves are being packed with Neoprene strip rubber. As soon as the building is filled, these valves will be checked for leaks.

The coolant coolers of Cell #7 in K-303-8 and Cell #1 of K-303-9 have been opened. Considerable amounts of mud, stones, and tar were removed from the coolant cooler water section.

Building K-306-7 was filled with coolant, but upon trying to start the circulating pump it was found that several refused to budge. The cell pumps that would not operate were those of Cells 1, 5, 8, 9, and 10. The shafts were frozen and it is claimed that they were over-lubricated.

From observation it appears that there will be quite a few more pumps in the K-306 buildings that will react the same way.

When K-306-7 was being filled, it was noted that there were several leaks, the two worst ones being on Cell #3 at the flange on the inlet to the surge tank, and at the large Chapman valve between the drain drum and transfer pump.

In Building K-303-4, Cell #1, trouble was experienced with the bearings of the motor on the coolant circulating pump. It was necessary to shut down the pump to repair it.

~~CONFIDENTIAL~~

Dry Air

Ambient Air

All buildings above 303-1 are on a dead end system with installation of crossovers and controllers between the supply and return headers, and removal of Buffalo booster fans is progressing. Buildings below 302-5 are still on the recirculating system. Dew Points in all sections appear satisfactory.

Hydryers

At present the hydriers are treating about 45,000 scfm of air composed of 59% makeup air. The Dew Points leaving the hydriers during the past week have averaged about -60°F.

Instrument Air

Installation of the Fulflo filters in K-304-4, K-304-5, and K-305-4, is progressing.

G-74

Data is being collected by various departments in Carbide to obtain a more accurate estimate on the total consumption of G-74 in the Process Area. A program is being set up to determine whether any particular building uses an excessive quantity of G-74.

Plant Air

Hydryer equipment is being installed and should be ready within a month.

Valves

G-17-A Valves - It has been found that Firestone seats have a tendency to adhere to the mating ring and pull out from the disc when the valve is opened. The use of lower torques has been recommended to alleviate this situation. Carbide has requested that "C" rubber seats be used as replacements when a leaky valve is repaired.

Analytical

1. Examination of G-616 Condensed from Conditioning Gases

Samples of G-616 condensed from the conditioning gases used on one of the "reacted" converters (B-386X) were submitted to Mr. Priest's laboratories for examination and analysis.

## 2. Examination of C-216 Disposal System


The purpose of this investigation was fourfold:

- (a) To determine the pumping efficiency of the four emergency Stokes pumps for handling a "load" of gas coming from the process area or the discharge lines from the Conditioning Building.
- (b) To investigate the location and the nature of the deposit inside the pipe lines leading to the caustic tower.
- (c) To suggest a method for decontamination of C-616 piping.
- (d) To advocate, using the information obtained from (a), a means of preventing the C-616 from condensing in the gas discharge lines.

Runs were made on 7/26/45, on the C-216 - G-74 discharge of Building 305-12, Cell #2, and also on 8 cells of Building 305-11. The Stokes pumps operated very satisfactorily, pulling an average vacuum down to approximately 1.5 psia during the time when there was a constant feed to them from the discharge lines. With no feed, the pressure in the lines could be reduced to 0.5 psia. This pressure is equivalent to the vapor pressure of C-616 at 40° F. Thus, it may be said, that under such operating conditions no C-616 should be expected to condense in the lines if the temperature in the pipes is 40° F. or greater.

### Analysis of Solution from Caustic Tower

Samples are still being taken once every shift. The T analysis have been running, in general, between 0 - 10 mg/l.

  
C. A. Johnson

CAJ:ca

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**(SANITIZED VERSION OF CRD DOCUMENT # KZ-3216)**

Compiled by  
S. G. Thornton  
Environmental Management Division  
OAK RIDGE K-25 SITE  
for the Health Studies Agreement

December 21, 1995

Oak Ridge K-25 Site  
Oak Ridge, Tennessee 37831-7314  
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*DG Kortman/sst* 3/1/96  
Environmental Office  
Oak Ridge Site

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Series A

REPORT NO.

KZ 3216

THE KELLOGG CORPORATION

WEEKLY PROGRESS REPORT

PROCESS ENGINEERING GROUP AT SITE

August 11, 1945

## Cascade Operation

Building K-305-12 is still being used as the top purge point for the cascade. All cells in the cascade above cell 8 of K-305-11 are being used as purge cells. K-305-10 is still acting as a side purge building.

The cascade operated uneventful until on August 7th at which time building K-309-3 was isolated from the cascade and placed on building inverse recycles due to a 12,000 scf/day leak. The inleakage was coming from a leaky valve in C-616 vaporizing unit connected to the "B" spare line of K-309-3. K-309-3 was isolated from the cascade for approximately one hour because of the inleakage. The cascade was split at K-301-5 for approximately one hour so that cells 5 and 6 of K-301-5 might be used to accumulate the G-74 which had entered the cascade.

At 8:20 A.M. 8/11, building K-310-1 was isolated because of an inleakage of 40,000 to 50,000 scf/day which was coming from a cold trap while material was being flashed from the cold trap to cell 1 of K-310-1. Approximately 350 scf of air - G-74 entered the cascade. Cell 1 as well as the cold trap were isolated from the cascade to stop the inleakage. K-310-1 was then placed back in the cascade at 8:45 A.M. 8/11. The cascade was split between cells 6 and 8 of K-302-5 at 8:45 A.M. 8/11 to trap the air - G-74, but the "A" outlet valve of cell 8 leaked and allowed a considerable amount of air - G-74 to continue up the cascade before the "A" outlet block valve of cell 6 could be closed. The cascade was connected together at 11:15 A.M. 8/11. It is believed that the air was accidentally allowed to enter the cold trap through a carbon trap connected to it.

## Instrument Air

A survey of the instrument dry air system revealed that the filters installed before each positioner are not effective in all cases in removing finely divided carbon particles from the air. Experiments are being conducted to determine the size and type of a main filter to be installed in the dry air header in front of each building.

One test has been performed to determine the G-74 consumption of the Moore Inverting Pooster Relays. More tests are planned for the near future. The results of these tests will be utilized in checking the pump duty for the new proposed datum system.



### Control Valves

The control valve calibration data as received from Section 1400 has been transformed into a working curve that should be available for distribution during the early part of next week. A survey of the number of Crane valve bellows failures is being made to determine whether an alarm system, indicating defective bellows, is necessary for proper operation of the plant.

K-312-3 was observed while operating on building direct recycle and some results recorded.

### Section 600

The controller systems in Section 600 were subjected to a test to determine their effectiveness in handling surges. K-311-1.3 was evacuated into Section 600 from three pressure levels. The recorded results are being tabulated and will be presented in the form of a report.

Operation of Section 600 was normal all week.

### Pump Seals

Three tests have been run to determine the G-74 inleakage into a cell with the seals flooded with a pressure of 5 psig.

The results of the first test probably are not representative of the true inleakages because of the poor correlation of results. This was probably due to blocked by-pass valves by-passing the G.E. Scanner.

The final two tests are more indicative of the inleakage values that may be expected with a 5 psig seal feed pressure.

The results are tabulated below:

<u>Cell Number</u>	<u>Normal</u>	<u>By-Pass Closed</u>	<u>By-Passes Opened</u>
K-302-5.6	3 scf/d	1000 scf/d	1000 scf/d
K-302-5.1	7 scf/d	745 scf/d	1550 scf/d
K-301-3.4	60 scf/d	635 scf/d	no test

### Cascade Purging

During the past week, building K-303-10 continued to act as a side purge and building K-305-12 as the top purge. Table I gives purge rates for the past week and analyses on previous dates which have been received since the purge figures were reported.

On August 3, carbon trap #518 which was the sole trap used in K-303-10 purge and product room from July 11 to August 3 was dumped and re-filled. Gamma ray analysis showed 19.1 lbs. of C-616 in the trap.

Trap #1 in K-305-12 cold trap room showed a gain (by weight) of 1.5 lbs. C-616 between August 3 and August 10.

These figures indicate a loss of C-616 through the cold trap of 150 to 200 mg/sec of purge gas. The results of analysis of cold trap effluent completely covering periods of operation of these traps are not yet available, previous analysis under identical conditions have indicated losses of 20 to 30 mg/sec.

#### Line Recorder

The first space recorder and the first OA analyzer went on stream August 10 in 305-12, the present top building. It is too soon to discuss results yet. The second copy of the first model OA analyzer is being loaned to Dr. Paxton for experimental work in Section 1400.

The tests of dynamic line recorder calibration were proceeding too slowly. Difficulties so far have been purely of mechanical and vacuum types.

#### Cold Trap Capacity Tests

The third and final #5 Cold Trap capacity test has been completed. This run was made at a nominal flow rate of 4.47 scfm and a concentration of 20% C-616. A total of 242 lbs. of C-616 was drained, compared with a total of 310 lbs. pumped to the trap.

The difference between this amount of C-616 charged to the cold trap and the amount drained during the first two capacity test runs has been accounted for by 104 lbs. of C-616 found in the carbon trap being used.

This material was evidently blown into the carbon trap when the trap was unplugged by applying G-74 pressure.

It is assumed that the 68 lbs. of C-616 which was lost during G-74 purges from the trap during the third run will also be found in the carbon trap.

These tests have been discontinued since the traps have been accepted as safe for use in Section 3A even though completely filled (providing no hydrogen is present inside the trap) and have been declared unsafe for use in section 3B if they hold more than 132 lbs.

#### Cold Trap Room Operations

From 8/3 to 8/10, it was necessary to utilize the recovery cold trap rooms to service 16 cells. 8 cells had come off stream for repairs, 7 cells contained 100 % G-74, and in one cell C-216 was present.

Cell 7 in building K-303-3 had been conditioned and the gas concentration also present. A small amount of C-616 was and therefore the gas had to be cooled before it entered the Beach-Russ pumps to prevent any reaction with the MFL oil. The gas entered the cold trap room through the

C-616 return header and passed through the cold trap through the cold trap evacuation header to the suction of 1 Beach-Russ pump. The Beach-Russ pump discharged to the discharge header into the C-216 line and finally to the C-216 disposal plant. The suction pressure of the pump was controlled at an average value of

During the evacuation of cell 3 in building K-310-2, a pump seal was removed prematurely. Ambient air entered the cold trap room and consequently the mist filters and cold trap showed signs of plugging. When the cold trap was heated up, an early pressure rise was observed due to the presence of HF. With the trap temperature at 15 F., the HF was removed by blowing G-74 through the inlet.

#### Valley Iron "R" Pumps

During the past week the bellows seal "R" pump has been running on G-74 with the throttle valve wide open. It is operating satisfactorily at the following conditions:

Suction pressure

Suction Temperature

Discharge pressure

Discharge temperature

Running time to 8:00 A.M. 8/10/45 1923 hrs. 59 mins.

310-3 The carbon seal pump has been operating satisfactorily all week on G-74. The seal leakage has dropped from 0.05 to 0.04 scf/hr, probably due to "wearing in" of the carbon rings. C-616 has been charged into the loop (4:22 P.M. 8/9/45). The pump is running at the following conditions.

Suction pressure

Suction Temperature

Discharge pressure

Discharge temperature

Seal chamber temperature

Running time to 8:00 A.M. 8/10/45 202 hrs. 42 mins.

312-1 Both carbon seal pumps are not yet in operation.

#### Purge Cascade

312-3 The bellows in the stage 2 pump of cell #22 failed at 10:30 P.M. 8/7. The leak was indicated by the bellows evacuation alarm system, which operated smoothly. This system actuates a horn and light alarm, and automatically

floods the bellows chamber with dry air from the evacuation header through the by-pass trap. The cell was on direct recycle with G-74 when the break occurred.

The failure is believed to have been caused by a bellows clip which had broken loose during operation. The break was in the inner bend of the first active convolution of the third bellows from the bottom of the assembly, directly behind a rubber post. At this point, the bellows clip had broken loose from its cotter pin and so lodged as to deflect the top convolution.

Experience in the test loops has shown that these bellows clips are useless on the first convolution of each bellows. No evidence was found that they were detrimental. However, with this failure directly attributable to the end clip, the removal of end clips from all the pumps should be reconsidered. Some were already removed, but poor workmanship during this work caused a large percentage of bellows to be damaged, so the program was discontinued.

Building K-312-3 was run as a cascade on direct recycle, with G-74 feed to cell 5, and the safety recycle controller in operation. G-74 was fed through recycle line with the new Moore valve and G-74 surge drum, holding surge drum pressure in Cell 1 constant by tops withdrawal. This operation will be covered fully in a subsequent report.

#### Cascade Inventory

The memorandum on the average daily production of enriched light component that was described last week was issued.

Further study of the inventory data revealed that 80 per cent of the variability in the estimate of the plants' total enriching work is due to the variability in the estimate of enriched light component in the cascade. Further, it was found that no single cause for this latter variability can be expected. It is, on the contrary, due to a considerable number of small, independently acting causes. One of these causes was found in the variability of barometric pressure. This variability is weakly correlated with the total inventory of T, about 20 per cent of the variability in T being accounted for by the variation in barometric pressure.

#### Separation Performance

A report, on the correlation of B values (separation factors for C-816 and C-616) was reviewed. It was found, that statistical interpretation would not improve the excellent fit that the equation already provided.

An equation was developed connecting the precision of measurement of "R" (the ratio of top to bottom concentration of light component), and the precision of estimation of building separation factors.

#### Precision of Measurements

An "analysis of variance" of 280 abundance ratios (used for determining building separation values) showed that the error due to sampling is about as large as that due to the assay itself. This means (a) that a study of the causes of sampling error should be made with a view to cutting down this error, and also (b) that about as many samples should be taken, as duplicates are run on each sample, so as to get representative sample including both sources of error.

The precision of B-laboratory assays is reported to be proportional to the square-root of the concentration. This was checked by correlating 123 duplicate assays with the square root of the mean of each pair. A weak connection was found, which may be summarized in the statement that 20 per cent of the variability in duplicate assays may be assumed to be due to the square root of the concentration of the sample being analyzed. This is being studied further.

#### Ambient Air

Dew Points leaving the hydriers have ranged between -60 F., to -65 F., for the week. Hydriers #5 and #6 are now in operation. A failure in the 1100 Section during the night of August 9th caused the ambient air supply pressure to drop to 1 psi, and the dry instrument air to go to 14 psig for a short period of time.

Several buildings which had Dew Points consistently below specifications for several days were improved when dry instrument air was substituted for plant air.

G-74

A record was not kept of the amount of G-74 used by various departments this week. It was noted that a sudden drop in consumption amounting to 30 - 40 % occurred during July 31st and August 1st. To date there is no explanation for this decrease.

Analytical

1. Analyses for T in Caustic Tower

Analyses received after those reported in last week's Progress Report still show between 0.000 and 0.010 g. T/liter.

2. Examination of C-216 Disposal System

A three foot section of the base from the emergency stack of the Disposal Unit was removed for inspection and replaced by a new piece. The "cut-out" pipe was found to be filled with a dark green solution and plugged with a green solid (probably  $TF_4$  and other metal fluorides). Samples of both solid and liquid have been sent to the Carbide laboratories for examination and analysis, and the "cut-out" pipe section will be subjected to several decontamination procedures in an attempt to discover a suitable means for cleaning of pipe lines.

Converter #B-386-X from stage #1 in K-303-3 was exposed. Analysis of the conditioning gas at the end of the run showed 350 mg. T/cu.ft. The gas was passed through a cold trap at  $-55^{\circ}F.$ , collecting 87 grams of material. This sample was analyzed for fluorocarbons by the Carbide laboratories, and contained .04% fluorocarbons, mostly C-816

It is to be noted that this converter had been purged repeatedly with G-74 before it was brought over to the conditioning building for treatment. As a result, any large amounts of C-816 that may have been present originally would have been removed by this flushing procedure.

Coolant System

There has been much trouble lately with the coolant coolers of the cell systems. Mud, stones, and tar have been getting into the water side of the cooler, reducing the transfer efficiency. To date, no successful method has been devised that will satisfactorily clean the exchangers without dismantling the entire part and manually cleaning the tubes and shell.

One method has been tried unsuccessfully, and that is to introduce air at 40 pounds pressure; first at the front end of the cooler and then at the back end of the cooler. The cooler in K-303-2, Cell #2, has been given this test but no noticeable effects have been obtained.

The coolant drying section of 300-C is being prepared for use. A considerable amount of contaminated coolant has been collected there, which will have to be reconditioned.

### Valves

#### Determination of Minimum Closure Torques for G-17-A Type Valves with Firestone Seats

Tests were run on each of a 4", a 6" and an 8" Crane G-17-AF valve to determine the minimum torque required for seat tightness. The suggestion made by Dr. Rosen was to use 5 ft. lbs. per nominal inch of valve size as a start.

Two valves, a 6" and an 8", were tested after new Firestone seats had been installed. One 4" valve was tested with the Firestone seats originally installed at Crane. The latter had stood in a closed position at 18 ft. lbs. torque for a little over seven weeks.

The leak rates on both seats for all three valves was zero m.c.f.h. when the valves were torqued according to Dr. Rosen's suggestion; i.e.,

4"	20 ft. lbs.
6"	30 ft. lbs.
8"	40 ft. lbs.

#### Study of the Adhesion of Firestone Seats to the Seating Tubes of the G-17-A Type Valves

Four 6" Crane G-17-AF valves have been set up to study the adhesion problem. The history of the valves to date is given below:

- (1) 6" G-17-AF Crane Valve #299  
(Shipped from Crane in closed position on June 1, 1945.)

Torque when examined on August 1, 1945, was 18 ft. lbs. The seats showed no sign of adhesion to the mating rings, and no discoloration of the rubber.

The valve was torqued to 100 ft. lbs. on August 2, 1945, and put aside for later examination for adhesion.

- (2) 6" Crane G-17-AF Valve #289  
The date of shipment from Crane is not known, but it is presumed to be about June 1, 1945.

Torque when examined on August 1st, 1945, was 16 ft. lbs. The seats showed no signs of adhesion, and very slight discoloration.

The valve was torqued on August 2, 1945, to 150 ft. lbs. and put aside for later examination for adhesion.

- (3) 6" Crane G-17-AF Valve #306

The valve was shipped from Crane Company on June 4, 1945, in the closed position.

The torque when examined on August 1, 1945, was 10 ft. lbs. The seats showed no signs of adhesion to mating rings, and very slight discoloration.

Valves (Continued)


The valve was opened wide and 6" x 5" monel reducers were welded to the arms. After cooling, the valve was torqued to 100 ft. lbs. and put aside for later examination for adhesion.

(4) 6" Crane G-17-AF Valve #283

Shipped from Crane Company on May 29, 1945, in a closed position.

The bonnet of the valve was milled off and new (light colored) Firestone rubber seats were installed. After the bonnet was welded back on, the valve was torqued and put aside for later examination for adhesion. The torque was checked on August 8, 1945, and found to have relapsed to 20 ft. lbs. It was torqued up again to 30 ft. lbs.

There is as yet no operational data on P-10 seats in the field.

  
C. A. Johnson

CAJ:ca



TABLE I

DATE	PURGE RATE - SCFD.			ANALYSES K-303-10	
	K-303-10	K-305-12	Total	Mol % O.A.	kg T/ft <sup>3</sup>
7/19	3260	0	3260		
7/20	3190	0	3190	0.1	660
7/21	2280	0	2280		
7/22	1850	0	1850	0.1	2258
7/23	1860	0	1860	0.4	1082
7/24	2630	0	2630	0.9	316
7/25	2360	0	2360	1.1	181
7/26	1773	0	1773	1.7	165
7/27	1770	0	1770	0.4	342
7/28	1730	0	1730	0.5	217
7/29	2120	0	2120	0.2	2770
7/30	2300	0	2300	—	—
7/31	3000	0	3000	—	—
8/1 (1)	1248	658	2500	—	—
8/2 (2)	1500	560	2060	—	—
8/3 (3)	1330	365	1695	—	—
8/4	1400	900	2300	—	—
8/5	1212	400	1612	—	—
8/6	1469	300	1769	—	—
8/7 (4)	2000	1100	3100	—	—
8/8 (5)	1380	500	1880	—	—
8/9	1800	500	2300	—	—

Notes: 1, 2, 3 - Figures corrected from previous reports.

4 - Leak occurred in feed to cascade.

5 - Integrating flow meter installed in K-303-10; no figures recorded yet.

Analyses have been made on the purge gas in K305-12, but the results have not been received.

## DISTRIBUTION

1. K-25 Site Records (RC)
2. ChemRisk/Shonka Research Associates
3. S. G. Thornton (K-25 EMD)
4. DOE Public Reading Room

ChemRisk/Shonka Research Associates, Inc., Document Request Form

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Date submitted to ChemRisk/Shonka and DOE 3/5/96

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K/EM-346

**SANTITIZED VERSION OF THE KELLEX CORPORATION WEEKLY PROGRESS  
REPORT PROCESS ENGINEERING GROUP REPORT DATED 7/21/95**

**(SANTITIZED VERSION OF CRD DOCUMENT # KZ-3214)**

Compiled by  
S. G. Thornton  
Environmental Management Division  
OAK RIDGE K-25 SITE  
for the Health Studies Agreement

December 21, 1995

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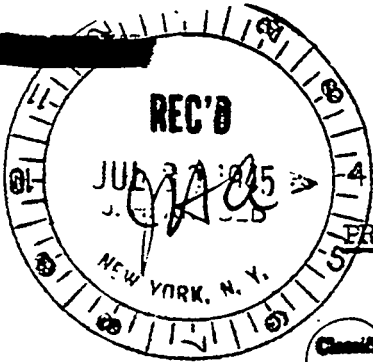
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## WEEKLY PROGRESS REPORT

PROCESS ENGINEERING GROUP AT SITE

REPORT NO. 1

KZ 3214

July 21, 1945

### Leak To Process

During the past two weeks the G-74 concentration at cell K-11-1.3 has been much higher than normal, indicating a leak below this cell which averaged about 800 SCF/day. On occasion during this period the 600 Section west loop had been isolated from the cascade, the isolation resulting in a simultaneous decrease in the leak rate. Although the pump seals for J-601A/J-602-3A in Section 600 were replaced the leak persisted when 600 Section was returned to the cascade after the first seal replacement. A subsequent seal replacement, made on 7/20, has apparently removed the source of inleakage. The concentration at the bottom of the cascade has returned to normal.

At 8:55 A.M. on 7/20, the G-74 concentration in cell 1 of K-310-3 increased, indicating a leak of about 1200 SCF/D of G-74. At 9:20 A.M. the 600 Section was isolated from the cascade but the inleakage persisted. At about 9:25 A.M., building K-310-3 was isolated with no effect on the inleakage rate. The cascade was then broken in two, one half consisting of the buildings between K-310-2 and K-302-5, and the other consisting of the buildings above K-303-1 with K-303-1.3 acting as surge capacity. When K-310-2 was made the bottom of the cascade the inleakage of G-74 returned to normal, indicating that the leak to process was below this point.

During the period that the leak to process was observed, the mobile 600 Section wagon was being purged. The 74 used for this purging was vented to the recovery cold trap room through the B spare header, raising the header pressure above process pressure. The only reasonable explanation offered to date for the observed leak, therefore, appears to indicate that the B inlet block valve on the spare header was leaking to process across its seat. This hypothesis was further substantiated when building K-311-1 was purged through the B spare header after running isolated on direct recycle for a special test. The G-74 concentration at the bottom of K-310-3 increased during the purge period.

### Section 600

Section 600 continued to operate on cascade during the past week. The seals in the pumps were suspected of leaking G-74 to process and pumps J601A/602-3A were shutdown. The seals of both of these pumps were removed and replaced although they did not appear to be badly damaged. During the start-up the M-G sets reversed their rotation several times causing the pumps also to reverse. Despite this the pump seals appeared to be all right and

the pumps were started. Apparently the change of seals had no effect on the G-74 inleakage and it was thought that the drop was coincidental with the isolation of the pumps but not a result of it.

On 7/20 the seal pressure of J-602-3A suddenly dropped to 5 psig, and there was an outleakage of 616 through the seals. The J-601A/602-3A pumps were immediately shut down and isolated and the seal of J-602-3A replaced. Again the seal did not appear to be severely damaged. At this time the difficulties with the M-G sets were partially straightened out so that they did not reverse rotation during starting. The pumps were restarted and put back on cascade.

It should be noted that in the case of the last two seal replacements no difficulty was experienced with the pumps during startup.

### Separation Efficiency

A program for measuring the separating efficiency of individual buildings is now in progress. It is planned to perform measurements on each size converter equipped with different barrier types. It is hoped to complete the program by August 1st.

### Line Recorders

Only 14 more tube racks must be installed in the last seven (7) buildings to complete K-25. The machines in the operating buildings were onstream 88% of the time this week.

The new "leak-proof" filaments from G.E. are performing satisfactorily so far.

Mr. Nowak's department now numbers 239 people. Besides routine operation of line recorders they are taking 1000 samples a week, running the product withdrawal, and conducting special cell inleakage tests. This last function is under G. L. Oglesby, who has checked inleakages in over 150 cells on inverse recycle in the last six weeks. The most interesting result of his work so far is the discovery that seal failures usually cause a leak of 100-400 scf/day of air instead of G-74. There is now a program underway to leak test all questionable seals with CO<sub>2</sub> and the line recorders.

Mr. Oglesby is starting repeated and detailed LR scans up and down particular buildings. These are showing up interesting inequalities between cells in air inleakage. The air inleakage seems to arise from a small number of cells with very high leak rates rather than a general deterioration of all cells.

The first space recorder is being installed in 305-12. It will probably be operating by August 1st.

### Cold Trap Capacity Tests

The cold traps in building 304-1 were conditioned July 15 and 16. Several test heating and cooling cycles were made in order to test instrumentation, etc. The test procedure was further delayed due to the necessary use of the cold traps for purging a cell.

On July 18, C-616 and G-74 were added to the intersectional cell and mixed by circulating with the cell pump. Due to the restricted flow path it required 27 hours to complete the mixing. This time will be reduced in the future by adding the C-616 and G-74 at the same time. The first run was started with a 10% mixture of C-616 in G-74 and a flow rate of 4.5 Scfm. After approximately 40 lbs. of material had been deposited, the pressure drop between the shell pressure tap and the outlet head increased to 6 psi. This was blown free with G-74 and the run continued. After 120 lbs. had been deposited the pressure drop had increased to 1.6 psi at a flow of 1.2 Scfm. This pressure drop was between the inlet and shell pressure taps. Analysis of the gas in the surge drum indicated 7% HF.

#### Beach-Russ Pumps

From April 1 to July 7, 42 Beach-Russ pumps were used in recovery room operation. During this time the recovery rooms were used 142 times to service cascade equipment. The amount of oil added to the pumps, in addition to that initially charged was 655 lbs. It is not possible to convert this loss to a mg/cuft. basis because of the lack of data on the amount of gas purged during each evacuation.

A better estimate of losses can be made in the purge and product rooms;

	<u>K-302-5</u>	<u>K-303-10</u>
Additional oil required-lbs.	85 3/4	58 3/4
S. l. cuft. of gas pumped		
Conditioning	33,000	66,000
Cascade purging	190,000	71,000
Oil loss mg/cuft.	176	150

This total loss figure is probably high due to hold up in mist filter and connecting lines. The figure for the amount of gas pumped does not take into account the miscellaneous uses of the pump required during operating.

#### Cascade Purging

The following table gives the volume of gas and the concentration of OA and C-616 purged from the plant during the past week:

<u>Date</u>	<u>Purge Rate</u> <u>SCF/D</u>	<u>Mol % OA</u>	<u>mg T/SCF</u>
7/11	2100		80
7/12	1885		111
7/13	1875		286
7/14	2100		214
7/15	2105		---
7/16	2340		---
7/17	2600		---
7/18	2560		---
7/19	3260		---

These analysis are averages of from 6 to 12 individual analysis per day. The gases leaving the cold trap have averaged 20 mg T/cuft. The cold trap has been operated at a refrigerant temperature of -80°F.

### Valley Iron "R" Pumps

311-1 - Bellows seal R pump #77 has been operating satisfactorily all week. It is still being used on performance test runs at suction pressures

During the past week, efficiency tests on 50% C-616 G-74 were made, and 25% C-616 runs were started. Running time to 8 A.M. 7/21/45, 1456 hrs. 50 mins.

310-3 - The set of pre-conditioned P-8 Miller Polymer rings will not be installed in the carbon seal pump. After treatment, the rings were found to have too great a leak rate as indicated on the special ring tester. Instead, the pump will be outfitted with a set of P-8 rings and graphite rings as heretofore, but the pump will be run on very low P.G. concentrations (~1%).

312-1 - Pump #1 was shut down last week because of a clogged 2144 pump filter. The 2144 oil was drained and fresh oil added to the pump. The pump at the time of the filter clogged had run 1355 hrs. 22 mins. on the same charge of oil. The pump is now running satisfactorily.

Pump #2 running satisfactorily.

Running times to 8:00 A.M. 7/21/45

Pump #1	1391 hrs. 31 mins.
Pump #2	1134 hrs. 39 mins.

All three bellows sealed pumps under test have no run over 1100 hrs. without a bellows failure.

Pumps #3 and #4 were both shut down at 5:30 P.M. 7/17/45. Inspection of the seals showed that they were in good shape, with only a slight amount of powder produced. Shaft will be inspected as soon as seal housing chamber is removed.

Pump #3	596 hrs. 35 mins. to shut down.
Pump #4	618 hrs. 58 mins. to shut down.

### Purge Cascade.

Six R pumps were started in cells 5, 7 and 9. Pump 1 in cell 5 showed a chamber leak, so cell 5 was shut down. Cells 7 and 9 were put on inverse recycle and R pumps run at a suction pressure of about 1.3 psia and C.R. of about 2. The pumps were run from 9 P.M. 7/20 to about 7 A.M. 7/21 with frequent stops to inspect the filter screen on the Bijur pump. No clogging was noticed throughout the night.

The switch on the field circuit on the D.C. motor of the M.G. set opened from vibration. However, an overspeed cutout kicked out the set when frequency reached 75 cycles. This corresponds to R pump speed of 1100 RPM. However, it is doubtful that the pumps reached this speed because of lag, and the short duration of the high frequency.

### Coolant System

Butyl rubber packing rings are being installed in about 35 valves of Bldg. K-305-10. As of this writing half of these valves have already been packed.



The coolant transfer pump in K-305-5 was checked while pumping from the drain drum to Cell #9. There was a momentary start-up surge which registered 180 to 190 psig on the operating floor. Under steady pumping conditions, pressure readings of 82 to 90 psig were obtained. More data will be collected on this subject early next week. These tests are being made to determine if S.S. valves can be used to isolate the cell coolant system from the coolant storage.

### Analytical

#### I. Analysis of Mist Filter Residue

Westinghouse mist filter #5-24P-626, class #6, from pump #1 in K-302-5 cold trap room was opened for inspection on June 28, 1945. Samples of the material that was plugging the filter were analyzed, and the results showed a  $\text{TO}_2\text{F}_2:\text{TF}_4$  ratio of approximately 4:1, indicating that there was some chemical reaction between the C-616 and the large metal surfaces involved. However, most of the residue was formed by the hydrolysis of the process gas.

#### II. Examination of Converters

Converter #A-314, Stage 1, in Cell 4, K-301-4, had been reconditioned

The above converter developed leaks in approximately forty percent of the coolant tubes, and it was discovered upon opening the converter that sections of the copper coolant tubes in the head of the converter had been destroyed and large pieces of hard, rust-colored residue had been formed. Both samples for laboratory analysis and photographs have been taken.

Converter #B-386-X, Stage 1, in Cell #1, K-303-3 is at present being reconditioned in the Conditioning Building. The conditioning gases are being analyzed for C-616 content. Samples of condensible gases will be taken as soon as the cold trap can be put into operation. These samples will be sent to the Harshaw Chemical Company and S.A.M. Laboratories for analysis.

#### III. "T" Analysis from the C-216 Disposal Plant

The disposal plant is being sampled once each shift for X and T. No results have been received as yet from the laboratory on the former, but "T" analysis are reported in the following table:

<u>Sample no.</u>	<u>Date</u>	<u>Shift</u>	<u>Location of Sample*</u>	<u>"T" - Gr./L</u>
1444	7/14/45	12-8	Not specified	< .001
1445	7/14/45	8-4	Not specified	< .001
1463	7/14/45	4-12	Tower Discharge	< .001
1468	7/15/45	12-8	Tower Discharge	0.0089
1469	7/15/45	8-	Tower Discharge	< .001
1474	7/15/45	4-12	Tower Discharge	< .001
1371	7/9/45	8-4	Tower Discharge	< .001
1375	7/9/45	4-12	Tower Discharge	< .001
1380	7/10/45	12-8	Tower Discharge	< .001
1388	7/10/45	8-4	Tower Discharge	< .001
1393	7/10/45	4-12	Tower Discharge	< .001
1402	7/11/45	12-8	Tower Discharge	< .001
1403	7/11/45	8-4	Tower Discharge	< .001
1408	7/11/45	4-12	Tower Discharge	< .001
1411	7/12/45	12-8	Tower Discharge	< .001
1414	7/12/45	8-4	Tower Discharge	< .001
1425	7/12/45	4-12	Tower Discharge	< .001
1391	7/10/45		Sludge from #4	< .001
1428	7/13/45	12-8	Valve Settling Tank	< .001
1432	7/13/45	8-4	Tower Discharge	< .001
1440	7/13/45	4-12	Tower Discharge	0.0022
1444	7/14/45	12-8	Tower Discharge	< .001
1445	7/14/45	8-4	Tower Discharge	< .001
1463	7/14/45	4-12	Tower Discharge	< .001
1468	7/15/45	12-8	Tower Discharge	0.0089
1469	7/15/45	8-4	Tower Discharge	< .001
1474	7/15/45	4-12	Tower Discharge	< .001
1475	7/16/45	12-8	Tower Discharge	0.011

<u>Sample No.</u>	<u>Date</u>	<u>Shift</u>	<u>Location of Sample*</u>	<u>"T" - Gr./L</u>
1478	7/16/45	8-4	Tower Discharge	<.001
1486	7/16/45	4-12	Tower Discharge	<.001
1491	7/17/45	12-8	Tower Discharge	0.006
1498	7/17/45	8-4	Tower Discharge	<.001
1508	7/17/45	4-12	Tower Discharge	<.001
1511	7/18/45	12-8	Tower Discharge	0.004
1518	7/18/45	8-4	Tower Discharge	0.004
1521	7/18/45	4-12	Tower Discharge	0.006

\*All samples taken from tower discharge near inlet.  
Accuracy of results =  $\pm 3\%$  of reported value.

#### Dry Air

The Dew Point of the air leaving the Hydryer since 5/10/45 has varied from  $-60^{\circ}\text{F.}$  to  $-65^{\circ}\text{F.}$ , whereas, specifications call for a Dew Point of  $-80^{\circ}\text{F.}$  Carbide attributes the low Dew Points to the performance of the Hydryers. A check made recently on Hydryer H-4 revealed it was producing air at  $-60^{\circ}\text{F.}$ , Dew Point to  $-65^{\circ}\text{F.}$ , Dew Point. Since the present regeneration cycle may not be correct, further testing is planned. For the last week the average Dew Point at the Dry Air Plant has been  $-63^{\circ}\text{F.}$

#### Dry Instrument Air

Six Fulflo filters are being installed and will be ready for testing within one week.

#### Dry G-74

The average Dew Point of the G-74 has been about  $-105^{\circ}\text{F.}$ , for the last week.

#### Valves

The following Crane valves were tested and reported leaking in the past week:

#### Bldg. X-301-3 Cell #2

<u>Valve</u>	<u>Size</u>	<u>Torque - ft. lbs.</u>	<u>Leak Rate m.c.f.h.</u>
"A" Outlet	12" G-17-A	125	$3.46 \times 10^4$
"B" Inlet	14" G-17-A	105	$7.2 \times 10^9$
"A" Inlet	12" G-17-A	120	$6.87 \times 10^3$
"B" Outlet	14" G-17-A	150	$1.05 \times 10^5$

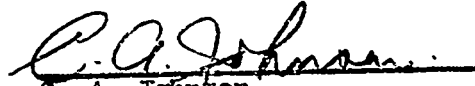
Bldg. K-301-4, Cell #2

<u>Valve</u>	<u>Size</u>	<u>Torque - ft. lbs.</u>	<u>Leak Rate m.c.f.h.</u>
"B" Inlet	14" G-17-AF	90	$8.57 \times 10^4$
"A" Outlet	12" G-17-A	95	$4.69 \times 10^3$
"A" Inlet	12" G-17-A (a)	100	$1.4 \times 10^4$
"B" Outlet	14" G-17-A	125	$7.56 \times 10^6$

(a) No record as to whether seats were "C" rubber or Firestone rubber.

The valve seats of cell #2 of K-301-4 had been exposed to C-616 since June 3, 1945, and those of Cell #2 of K-301-3 since May 31, 1945.

The 6" "B" Normal Inlet Building Block valve of K-306-4 was reported leaking badly because of a Firestone seat had pulled out of its disk. New Firestone seats were installed in this valve but it is reported as leaking now  $1.3 \times 10^2$  m.c.f.h. at 100 ft. lbs. torque. This valve will be opened again for examination.

  
C. A. Johnson

CAJ:ca

## DISTRIBUTION

1. K-25 Site Records (RC)
2. ChemRisk/Shonka Research Associates
3. S. G. Thornton (K-25 EMD)
4. DOE Public Reading Room